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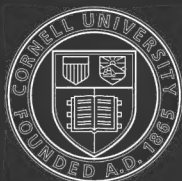


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## WAYSIDE WEEDS.







Sea Mulkwort.



Alpine Barrenwort.



Yellow Fumitory.



Pheasant's Eye.





# WAYSIDE WEEDS

OR,

BOTANICAL LESSONS

FROM

THE LANES AND HEDGEROWS.

WITH A CHAPTER ON CLASSIFICATION.

BY

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FUNCTIONS OF THE EYE," ETC., ETC.

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# Introduction.



# WAYSIDE WEEDS.



## INTRODUCTION.

### FLOWERS.

"On mountain and on hill side, in valley and in glen,  
A thousand lovely things spring up to cheer the hearts of  
men."

"And if we read aright the lines traced on their petals gay,  
We never more shall cast a flower with carelessness away."

"Oh! love them as companions, thou wilt not lonely be,  
They'll whisper with their fragrant lips the sweetest thoughts  
to thee;

They'll steal thy senses from the earth, thy thoughts from  
themes of pain,

And thou wilt feel with grateful heart they bloom not here in  
vain."

ROWLAND BROWN.

THE science of plants, Botany, has this great advantage over every other department of natural history, that its objects are not only most readily accessible, but that they have been familiar to most of us from childhood. The first steps of the entomologist, the geologist, or the mineralogist, are made, as it were, into a new world, wherein all is

strange and unknown—to the novice we might say chaotic—but who does not know the first easy paths which guide us into Flora's realms? Are they not to every child bordered and carpeted with daisies, and buttercups, and sweet-scented violets? Have we not picked in them chickweed and groundsel for our favourite birds, and looked at the scarlet poppies somewhat doubtfully as poisonous, putting them under the same anathema as "hemlock," which, however, was often not hemlock at all? Then, again, are not these paths overhung with the wild rose and honeysuckle for our summer shade? And when, after long absence, it may be, in the smoky town or in some foreign clime, we return to retread the once well-known paths again, and see these old familiar faces, do we not know their names as well as we do our own?

"The cowslip, crocus, columbine,  
The violet and the snowdrop fine,  
The orchis 'neath the hawthorn tree,  
The blue-bell and anemone,  
The wild rose, eglantine, and daisy."

We know them all, and many another, without any teaching.

Truly this name-knowledge is no despicable foundation for our future botanical education—a far better one than we could find for any other science; sounder, too, for it has not only a place in the head but in the heart; dull and dead must that heart

be, that greets not warmly the old friends of our first wee toddling days.

On this foundation we purpose to build, and thus to avoid what so often proves a first and formidable difficulty when subjects are dealt with of which the learners have no previous knowledge. We mean to take, both for text and illustration, the commonest wayside weeds and flowers familiar to all, and we mean them, being their own interpreters, to tell us a great deal. We will try whether they cannot outline for us, if we may so speak, the plan of the flowery world, and whether we cannot gather from their simple teachings some idea of the great design, in accordance with which the vegetable kingdom is constructed and arranged. It may be that many will be content with learning no more than this; but should some desire to go farther, and to gain wider knowledge of the numberless forms of vegetable beauty and structure to be met with amid the native plants of our own land, and still more strikingly, perhaps, amid those of other latitudes, they will find the foundation begun upon our common "Wayside Weeds," a solid because a practical one.

We call our chosen subjects common, and, in one sense, they are so—the sense in which we have selected them for illustration; but common are they in no other, for as surely and as well as the most gorgeous exotic do each and all show

forth the goodness, the wisdom, and the power of that great Creator, whose

“Steps are beauty, and his presence light.”

A few words as to our arrangement. Each of our prospective handfuls is intended to embrace a certain section of plants related to each other in the natural classification. It is by no means requisite that all the plants named should be gathered at once, and, indeed, as they often blow at different periods of the year, this would be impossible; but enough may always be found to illustrate our text, not only as regards the classification of the flowers, but with reference to the botanical lessons which are appended to each section. A general summing up will probably gather our handfuls into one.

## Handful I.

*Weeds are Flowers—The Handful—Poppies—Buttercups and Marsh Marigold—Wallflower and Lady's Smock—Violets—Lychnis—Stitchwort—Chickweed and Geranium—Petals or Flower-leaves—How attached—Their shape and parts—A corolla—Stamens, their site, and how distinguished—Pistil or central organ; its forms—Calyx; its forms, etc.—Position of parts of Flowers in Handful the First—Likeness and difference—The Buttercups and Crowfoots—Poppy characters—Wallflower and the Cruciforms—Regular Flowers—Summary.*



## HANDFUL I.

FLOWERS IN MANY PIECES. "MANY PETAELED."

    "To yon deep wood  
    With our baskets we will go,  
Find where the violet loves to brood,  
    And the primrose crouching low ;  
The gentle anemone shall be ours,  
    With its delicate pink and white,  
And the bright marsh marigold's gorgeous flowers  
    Shall give us their golden light."

LET us see what we have got. Weeds every one of them ! Weeds we all know them to be, but flowers they are as well ; we will therefore give them the name indifferently, weeds or flowers, as it may be. Poppies in their red, from the corn-field or wayside ; bright shining buttercups from the meadows, with their magnificent cousin the marsh marigold ; a stray wallflower from the old castle wall, or garden if you will, for it is a true British wilding ; lady's smock ; and a charlock—the yellow flower you always call wild mustard—or, if you like it better, a water-cress. Do not forget our wee

blue friends the sweet violets, for, except the fragrant wallflower, they are the only scented blossoms in our bundle. Add to these a scarlet lychnis ; one of the brilliant white stitchworts, or, as they are better named, starworts, from under the May hedge-row, and with it its little sister the common chickweed, and the mouse-ear, like a hairy chickweed, though it is not one ; lastly, put in a common wayside geranium, and we have Handful No. 1, from which we are to learn a whole heap of botanical lore.

Our paper is headed "Many-pieced, or many-petaled flowers." Unbotanical people call the pieces

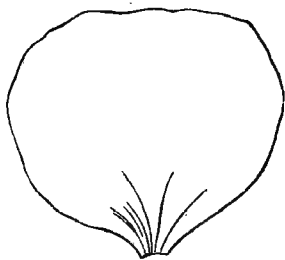


FIG. 1.—Petal of common Poppy.

of a flower "leaves ;" but as the same term is applied to the leaves of the plant generally, the pretty term "petal" is more convenient, we therefore, for the future, shall always speak of petals ; albeit, it gives our first initiation into botanical terms. Take all the flowers of our handful, or as many of them as you have got, and look at these petals ;



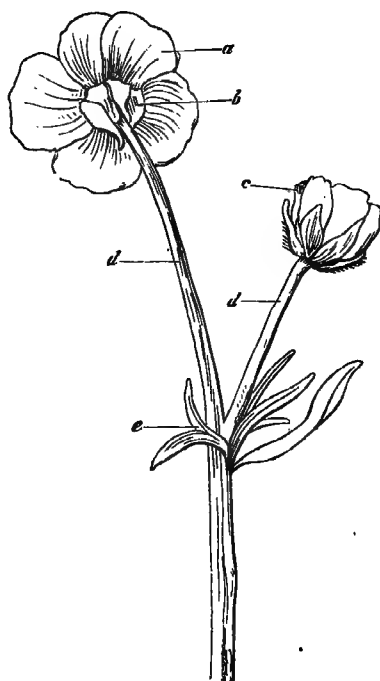


FIG. 2.--The Bulbous-rooted Ranunculus, back view. *a*, petals of expanded blossoms; *b*, reflexed calyx, or flower-cup; *c*, blossom half expanded, the flower-cup not yet turned back; *d*, peduncle, or flower-stem; *e*, bract or flower-leaf.

pull them off if you possess a good show of specimens, and you will see that they are all uncon-

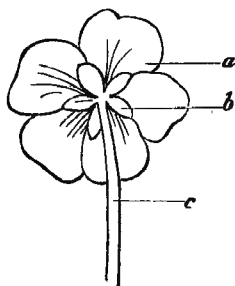


FIG. 3.—Back view of blossom of common Buttercup, or Creeping Ranunculus.  
*a*, petal; *b*, flower-cup, in five sections; *c*, peduncle.

nected with one another. First comes the bright red poppy, with its four petals (Fig. 1), all attached

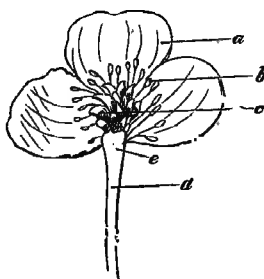


FIG. 4.—Section of Buttercup blossom. *a*, petal; *b*, stamens; *c*, pistils;  
*d*, flower-stem, or peduncle; *e*, receptacle.

beneath the projection in the centre of the flower (Fig. 6).

Put down the poppy and take up the buttercups, all you have gathered (Figs. 2, 3, 4), and, if it

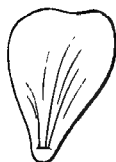


FIG. 5.—Buttercup petal.

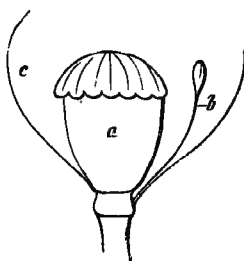


FIG. 6.—Seed-vessel or pistil of common Poppy, *a* ; *b*, stamen ; *c*, part of petal.

chances to be in the handful, the marsh marigold, which probably some of my readers know as the "May blob." Any and all of these have, as you see, five petals (Fig. 3), and though the central organ (Fig. 4 *c*) is not exactly similar to that of the poppy (Fig. 6), you may yet observe a likeness in the attachments of the petals beneath it. Take the wallflower, another of your bunch of blossoms, its petals are very different from the petals of the poppy or the buttercups. The latter you have already seen are oval and pointed at the base (Figs. 1, 5) ; in the instance before us they are prolonged into the *claw* (Fig. 8 *b*), in contradistinction to the broad portion or *limb*. A somewhat similar petal you find in the scarlet or white *lychnis* (Figs. 9, 10), although in other respects it is diverse. Clawed, likewise, but

less distinctly so, are the five petals of the wild geranium (Figs. 11, 12). However, there is no

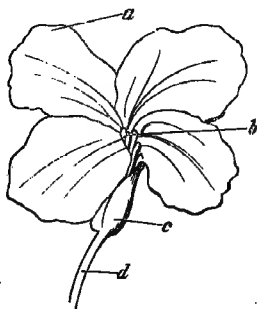


FIG. 7.—Cruciform blossom of Wallflower.

*a*, petal; *b*, stamens; *c*, flower-cup, or calyx; *d*, peduncle, or flower-stem.

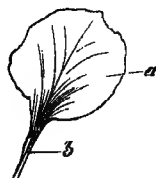


FIG. 8.—Petal of Wallflower.

*a*, limb; *b*, claw.

occasion to go over in succession every plant in our handful; you can do that alone, and pulling off the

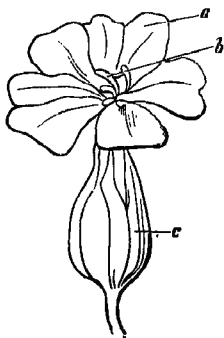


FIG. 9.—Blossom of *Lychnis*, with pistils only. *a*, petal; *b*, pistils; *c*, calyx.

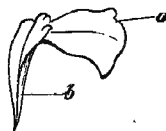


FIG. 10.—Petal of *Lychnis*.

*a*, limb; *b*, claw.

petals compare their varied shape and cuttings, as well as their attachments and numbers. Having

done this, you will have gained some knowledge of one of the divisions of the kingdom of botany—the

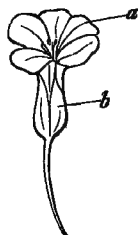


FIG. 11.—Blossom of common wild Geranium (Herb Robert). *a*, petals; *b*, calyx.



FIG. 12.—Petal of wild Geranium. *a*, limb; *b*, claw.

many petaled (*polypetalous*) flowers, with their petals attached beneath what botanists call the pistil, but



FIG. 13.—Stamen, magnified.

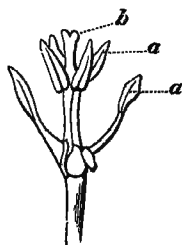
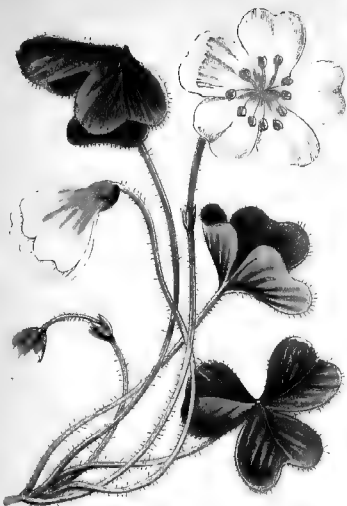


FIG. 14.—Reproductive organs of Wallflower. *a*, stamens; *b*, pistil.

which, till we have formally introduced it, we must call the central organ of the flower.

In the majority of flowers, however—we shall see, hereafter, not in all—between the central organ and the petals we have just been examining



Common Wood Sorrel.



Herb Robert.



Pasque Flower.



Grass of Parnassus.



there is a greater or less number of small bodies, little heads supported on slender stems (Fig. 13). In the poppy and ranunculus these little bodies are very numerous, almost too numerous to count easily (Fig. 4); but look into your wallflower, you have no difficulty there, for six is all you can find (Fig. 14), only you wonder to see that, in every blossom you examine, two are shorter than the others. Put down the wallflower, and take up your wild mustard (Fig. 15), or your water-cress, and

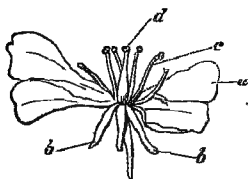


FIG. 15.—Blossom of common Charlock.  
a, petal; b, b, calyx sepals; c, stamen;  
d, pistil.

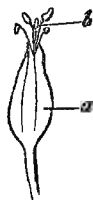


FIG. 16.—Calyx or flower-cup  
of common Lychnis. a,  
calyx; b, b, stamens.

you will find the same thing. Be sure you have got an established fact, and do not forget it. Take your lychnis, a red one, however, and you will find ten of these little bodies (Fig. 16); but, probably, no central organ. Try to count them in the violet, there are only five; but you have some difficulty, for they all adhere together, and two of them have little spurs superadded, which might confuse a beginner. These little bodies, which we have just been examining, are called the *stamens*, but what

they are, what is their structure and functions, we must tell in a future page ; only remark that, *in the flowers you have examined*, their attachment, in the composition of the blossom, is the same as that of the petals. Put aside the stamens, or pull them off, and we come, at length, to our friend in the centre, whose name we have already let out—the pistil (Figs. 4, 6, 17, 18), and a very varied piece

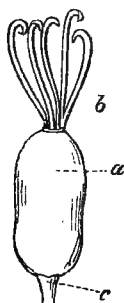


FIG. 17.—Pistil of *Lychnis*. *a*, ovary.  
*b*, styles; *c*, receptacle.



FIG. 18.—Seed-vessel and pistils  
of common *Stitchwort*.

of structure it seems, judging by the specimens. In the poppy it is short, round, and marked or rayed on the top ; in the buttercup it seems made up of a number of projecting pieces ; in the wall-flower it is prolonged ; in the *lychnis*,\* rounded and

\* To prevent confusion, it is necessary again to remark, that the *lychnis*, or catch-fly, is one of those plants which usually have their pistils, or central organs, in one blossom, and their stamens in another. This our readers must verify for themselves by examination of the plants.

oval, crowned by the thread-like styles. Observe, in all these cases, it rises from a little seat or *receptacle*, to which are attached the petals and the stamens.

You will not, however, have advanced far in your botanical studies before you discover that this single mode of attachment is by no means universal; but one thing you will find constant, the relative positions of the organs of the flower, which we have just gone over. Petals, or *corolla* as the petals are called collectively, stamens and pistils, are always placed in the same order, one within the other. They may not all be present; in some blossoms they are never all present together, but you will never find stamens outside the petals, or pistil outside the stamens.

There remains yet, for examination, one other part of the flower. Exterior to all the organs we have hitherto described, you cannot fail to have noticed a covering, or set of coverings, to which, as it holds the blossom generally, botanists have given the name of calyx, or flower-cup (Figs. 2, 3, 9, 16, 19, 20). This calyx, moreover, has its many differences, even in the limited number of plants we have as yet examined. It is divided, in most of our examples, like the corolla, into separate pieces; and as the divisions of the corolla are named petals, so are those of the calyx called *sepals*. Generally speaking, the calyx, or flower-cup, is green, but we see it in the wallflower (Fig. 7) more or less deeply

coloured; and in the buttercup (Fig. 2) yellowish in hue. Frequently the number of the sepals, or calyx divisions, corresponds to those of the corolla, but not invariably, as we see in the poppy (Fig. 20), in which there are but two divisions, and these joined at the top, more or less completely. Moreover, this poppy calyx does not, as in the wallflower, the chickweed, the violet, or the geranium, continue

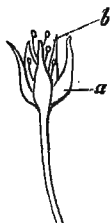


FIG. 19.—*a*, calyx or flower-cup of Stitchwort; *b*, stamens.

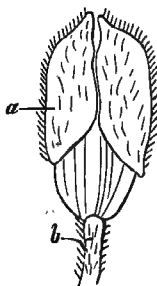


FIG. 20.—Expanding flower of common Poppy, throwing off calyx, *a*.

attached to the flower, but is cast off in the process of floral expansion.

Calyx, corolla, stamens, pistils—these, bear in mind, are the parts of a *perfect flower*, which always preserve the same relative positions within one another. With the exception of the *lychnis*, already noticed, you will find it so in every plant in our Handful. To make sure, look at the bright white, well-named starwort, or stitchwort, which

we have not yet noticed ; all the parts are just as you have seen them in the others. Differing in many respects, in this all our plants agree—the *petals are perfectly disconnected from one another, and from the stamens, and with the stamens are fixed to the little receptacle on which is placed the pistil*. Now these characters, as we call them, though apparently unimportant to a superficial observer, are far from being so to a botanist ; they mark, in fact, one division of botanical arrangement—a division, moreover, which comprises within its limits many other plants and families of plants, beyond the few common weeds we have selected as examples. The buttercup or crowfoot family, or, as it is called botanically, the *Ranunculus* genus, is made up of numerous individual members, all differing from one another, but yet bearing the general family face. Some so like that you will not distinguish them till the difference has been pointed out ; others, though similar, still so different, that you cannot mistake them for each other.

You have, in all probability, gathered into your handful, at random, a lot of what you call buttercups ; they have all flowers about the same size, with bright yellow shining petals, and look as like as possible ; but take this one, which you gathered in the meadow—if you have got it up by the roots (*as you ought to do every plant, the size of which in the least admits it*)—you find that it has a bulbous

swelling root, that its stem is upright and hairy, and its calyx sepals are turned back (Fig 2) from the fully-expanded flower. This, which is the *Ranunculus bulbosus*, or bulbous-rooted crowfoot, put beside the other which is in your Handful, and which, when you gathered it, you thought was precisely similar. Compare the flower-cup (Fig. 3) with the last. It spreads—in old blossoms it falls off—but does not turn down even in the fully-expanded flower; the root of this plant is not bulbous, and attached to it are side-stems, *scions*, which rest on or run along the ground. This is the *Ranunculus repens*, or creeping crowfoot; and no less different is this third species, the *Ranunculus acris*, or upright meadow crowfoot, which very likely grew beside the other two, and which, just as likely, you took into your Handful in perfect innocence of any difference. It, too, has a spreading, and not a turned-back calyx, but it has no *scions*. Make another comparison of these three near relations; their faces are all very similar, are they not? Look at the little stems, *peduncles*, which support the blossoms. In the first two species you examined, the bulbous and creeping crowfoots, these stems have little channels or furrows cut on their surface; in the last, the upright crowfoot, they are mostly rounded. Pray look over these little distinctions again, get them into your memory, and tell us, could you mistake these plants for one

another again? Quite impossible, for small as the marks of difference may be, *they are constant*. Lastly, get into your mind an idea of the general appearance of these plants—the general *habit*, as botanists call it—and you will have achieved a prac-

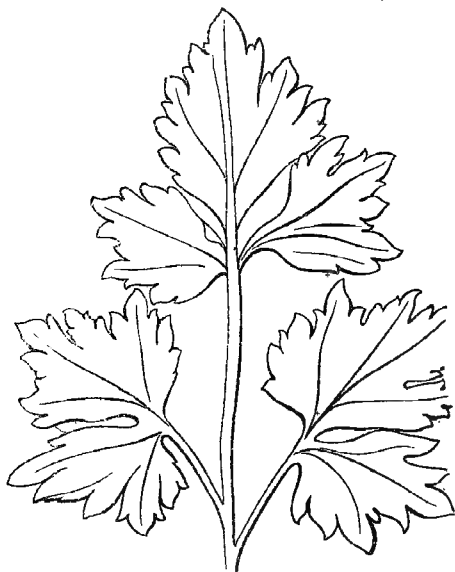


FIG. 21.—Leaf of common Buttercup.

tical lesson in plant lore which will not readily be forgot. The above are three of the crowfoot family, with a strong resemblance; but there are many of the same family, or, let us designate it properly, *genus*, very different; some have comparatively small flowers, and some are white, as we find in

the common water ranunculus, which is so common in every streamlet and ditch that it well deserves to be called a wayside weed. Look now at the leaves, not the petals, but the plant-leaves, of the buttercup race, with which we have just scraped acquaintance; they are all divided more or less deeply (Fig. 21), but we find others with leaves perfectly undivided: these are the spearwort ranunculuses, and one of them you may gather at the side of almost any pond. The buttercup-like flower of the spearwort you cannot mistake. One word more about our friends before we part. The members of the buttercup genus are most eloquent expositors of many botanical facts, and you are now in possession of the key to some of their peculiarities. If you use your eyes you cannot miss finding species different from those most common ones upon which we have founded our first lesson. Gather all you can; never mind, at first, if you do not know their names, but put them together, and compare in every part—leaves on the stem, and leaves springing from the root-crown, hairs or no hairs on any part, pistils plain or otherwise. These exercises will teach you how to look at plants, and make the very commonest weeds convey as much instruction as you could get from the rarest exotic. We have dwelt somewhat upon this ranunculus family, not only because of the well-marked characters of its members, but because so many of them are familiar

to us all from childhood, and meet us in every country walk. We must now say adieu, and look to the rest of our Handful.

Take another look at the poppies. You could not mistake a poppy, putting colour out of the question, for a buttercup. The petals composing the corolla are separate; it is true the stamens are numerous, and both are attached to the flower in the same manner as in the ranunculus, but here the resemblance ends. The calyx, as we have seen (Fig. 20), is entirely different, both in its divisions and in its development, and the round central pistil, in one piece, of the poppy (Fig. 6) is abundantly diverse from the many pistils of the ranunculus (Fig. 4). There are many other distinctions, which at present we are not prepared for.

We go to the wallflower (Fig. 7), the watercress, or the charlock (Fig. 15), all plants of the same great botanical section as the ranunculus and the poppy; that is to say, they have many-petaled flowers, and petals and stamens (Fig. 14) are similarly attached; but how different are they otherwise. The petals are clawed (Fig. 8), the stamens are definite in number, not many, and the central pistil is altogether dissimilar, as we may see more clearly if we examine any of these plants when the seed is well matured. Now, the wallflower, the watercress, the wild mustard, and many others similar, belong to a most important family, called the Cruci-

feræ, or cross-like plants, the petals being arranged in the shape of a cross, as a very little examination will show. Turning for a moment from wild to cultivated blossoms, you will find the characters of the crucifers well marked in any turnip, cabbage, or radish, which may chance to run to seed in your garden. In an economical point of view, there are few plant families more valuable to man than these crucifers.

Buttercup, poppy, wallflower, each types of their own particular family, have regular flowers; you can divide them in any direction through the centre into

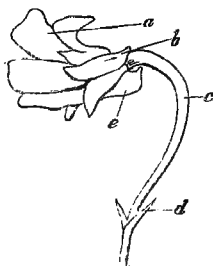


FIG. 22.—Blossom of Violet. *a*, corolla; *b*, calyx; *c*, peduncle or flower-stalk; *d*, bracts; *e*, spur of corolla.

two equal halves. Not so our sweet little violet (Fig. 22), which holds its place beside them. It, too, is many-petaled, and has stamens and petals attached like the others, but its flower is irregular; to divide its five petals equally, you must cut the centre in one direction only. The stamens and

pistil, a single glance will show, have their distinctive marks.

The lychnis, stitchwort, and chickweed bring us back to the regular flowers. The stamens (Figs. 16, 19) are more than in the wallflower, fewer than in poppies or buttercups. The petals are clawed (Fig. 10), the shape different, and, specially, the pistil (Figs. 17, 18) differs from the plants we have already examined.

Lastly, take the common wayside geranium (Figs. 11, 12) which we gathered into our Handful. Still we find the distinct petals attached with the stamens as before, only, at the base of the latter we come upon something new, the organs are united just in the reverse to those of the violet. The pistil, with its five lobes at the base, and its long beak, is very different from any we have yet met with, and with it we have arrived at the end of our first gathering. Just let us review what we have learned from it. We began, supposing that we knew nothing whatever of plants, and that all the stock of knowledge we had to start with was the recognition of the very commonest weeds of the wayside. Those which we selected for our first lesson were taken because of the one common character so often alluded to, the attachment of the distinct petals and the stamens to the organ named the receptacle, which supports the pistil or central organ. We have seen that but for this character

common to all, they differ widely, and we have learned, at the same time, what are the parts of which a complete and perfect flower is composed, namely, the calyx and its sepals, the corolla and its petals, the stamens and the pistils, and these organs we now know, and look for in a special order. Enough here for one lesson, albeit we have a much better capital of information to start with when we go forth in search of a Second Handful.

## Handful II.

*Broom Blossoms and Gorse or Whin—Clovers and Vetches—Hawthorn and Apple Blossoms—Strawberry and Bramble—Hemlock tribes—Saxifrage and Willow herbs—All many-petaled—Distinctions from Handful I.—Characters of Pea tribe—Rose tribe—Hemlock or Umbelliferous tribe—Properties and Uses—Parts of the Flower—Uses and arrangement.*



## HANDFUL II.

“The tribes of early flow’rets,  
Like holy thoughts enshrined,  
An altar to the unseen God,  
They raise in every mind.  
The hills and everlasting skies  
In grandeur have their birth,  
But the early flow’rets only  
His image bring to earth.”

BANKS.

HANDFUL the second; what have we got? Bright yellow blossoms of broom (Fig. 23), the bonny golden broom, which every one knows, or ought to know; and equally bright and golden are those of the gorse or furze, or, as it is called in Scotland, the whin, which *will* make themselves seen on every common and roadside. Take these, and add to them the first of the pea or vetch tribe (Fig. 24) you meet with, throwing in a few heads of clover to make up a family party, of which the members, you quickly discover, all carry the same family face. Go on with your collecting; gather hawthorn in its season, and a crab-apple blossom or two; wild

roses (Figs. 25, 26, 27) and meadow-sweet in theirs; with the flowers of the strawberry (Fig.

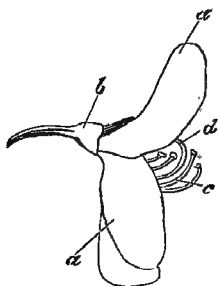


FIG. 23.—Blossom of common Broom. *a a*, petals; *b*, calyx; *c*, stamens; *d*, pistil.

28) and bramble (Fig. 29). You have in your hand

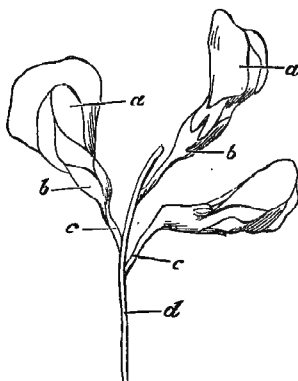


FIG. 24.—Blossoms of common Yellow Vetchling. *a a*, petals; *b b*, calyx *c c*, pedicels; *d*, peduncle. The flowers are papilionaceous, or butterfly-like.

another family as distinct as the first. Go and secure some of those plants which you have been in

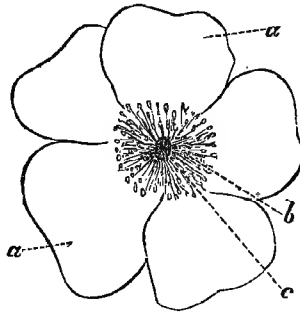


FIG. 5.—Blossom of Dog-rose, *a*, petals; *b*, stamens; *c*, pistils,



FIG. 26.—Back view of Blossom of Trailing Dog-rose, *a*, petals; *b*, urn-shaped tube of calyx, forming the seed-cup; *c*, upper divisions of calyx; *d*, peduncle.

the habit of calling hemlock, though ten to one if they are real hemlock; but let that pass at present.

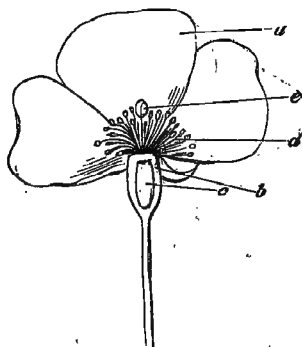


FIG. 27.—Section of Blossom of Trailing Dog-rose. *a*, petals; *b*, calyx, adhering to or forming the ovary or seed-vessel *c*; *d*, stamens; *e*, pistils.

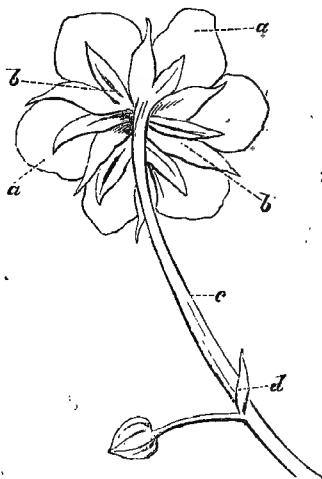


FIG. 28.—Back view of Strawberry Blossom. *a*, petals of corolla; *b*, sepals of calyx; *c*, peduncle; *d*, bract.

—we want the kind of plant for our present purpose (Fig. 30); and, if you have no other chance, go into the kitchen-garden, and pluck a flowering

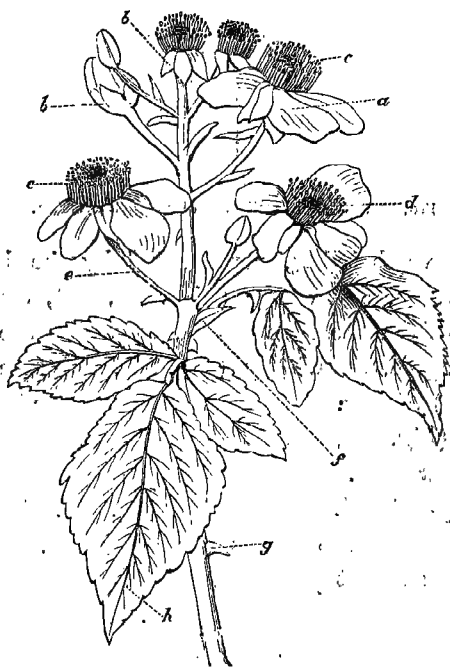


FIG. 29.—Collection of Blossoms of common Bramble, arranged in a corymb: *a*, petals; *b*, calyx sepals; *c*, stamens; *d*, pistils; *e*, pedicels; *f*, bracts; *g*, setæ or bristles; *h*, compound leaf.

sprig of celery, parsley, or carrot, or fennel, calling in, if necessary, the aid of the gardener or cook. You have now got a type of family No. 3 of our

present Handful. Lastly, the white meadow saxifrage and the willow herbs are so common that many of our readers may be able to add them to the company.

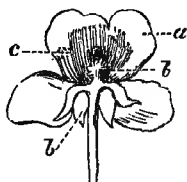


FIG. 29A.—Section of Blossom of common Bramble.

The vetch tribes, represented by the broom, gorse, vetch, and clover (Figs. 23, 24), are very distinct from the rose family, to which the hawthorn, apple, strawberry (Fig. 28), and rose itself (Fig. 25) belong. Equally diverse are our hemlock friends (Fig. 30), and not less so the saxifrage and the willow herb. Yet, pull them to pieces, they are all many-petaled, polypetalous (Fig. 31). Thus far they resemble the plants of Handful I., and, for aught you see at present, might be grouped with them; but we must look further. Different as the groups of Handful II. may seem from each other, they have one common point of resemblance in which they differ from Handful I., and that is in the mode in which their stamens and petals are attached to the other parts of the flower. Call to mind that in the many-petaled blossoms of Handful I. the petals and the stamens were invariably at-

tached (Figs. 4 and 6) to the part called the *receptacle*, which formed the support of the pistil; you could detach the calyx, or, as in the poppy and in



FIG. 30.—Blossoms of common Beaked Parsley, arranged in compound umbels.  
*a*, central point of primary umbel; *b*, bracts, or involucre, at central point of umbellule.

some of the *ranunculus* genus, it could detach itself, without interfering with the other parts of the blossom. A very few trials with the plants we have

now put into your hand will show that with them this cannot be done. If you take calyx, you take likewise stamens and petals, for to it they are attached, and not to the receptacle. All the examples you have will not show this equally well, but in some, such as the strawberry (Fig. 28) and others, it is very well marked. Perhaps this little difference in the attachment of the parts may appear to a beginner a very little difference to say so much about; and yet, slight as seems the line of demarcation, it severs groups of plants by a strictly natural distinction, which differ widely, not only in their outward appearance, but in their medicinal and economical properties. We dwell upon it, therefore, because it teaches one of the most useful and well-marked lessons in botanical distinction which we can lay before a novice, and because it is one which he can so easily verify for himself by means of the commonest wayside weeds or flowers. Here, then, we have the grand distinction between Handful I. and Handful II., both made up of many-petaled plants; but in the former the petals and stamens are attached to the receptacle underneath the pistil, in the latter to the calyx.

We now turn our attention literally to the business, or at least to the flowers in hand. We have found that those we are now examining are many-petaled, and that petals and stamens by their attachment to the calyx afford us a character which is a

common bond of union ; but after this, we must confess, we cannot show you any great resemblance. Vetch or pea tribe, rose or apple tribe, and hemlock tribe, to say nothing of saxifrage and willow herb, are not very similar.

Pull this broom to pieces ; it is an excellent example of its order. Off come its petals one by one (Fig. 31), and an irregular lot they look. In

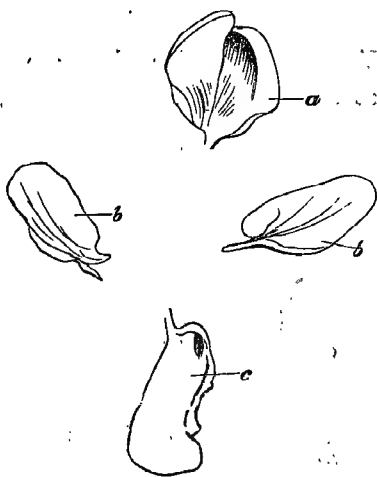


FIG. 31.—Petals of common Broom, separated. *a*, standard ; *b b*, wing ; *c*, keel.

truth, the pea-flowering tribe, in this country at least, has very irregular flowers, by which we mean that they can only be divided one way into two equal halves. You pull off the petals and the stamens remain (Fig. 32), and there they will re-

main, even long after the flower has withered and fallen, as we see in the example (Fig. 33). Look closely at the stamens (Fig. 32) after detaching the

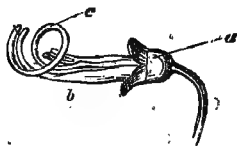


FIG. 32.—Calyx and essential organs of common Broom. *a*, calyx; *b*, stamens; *c*, curved style.

petals. You will perceive they are all joined together at the base by their filaments, and sur-

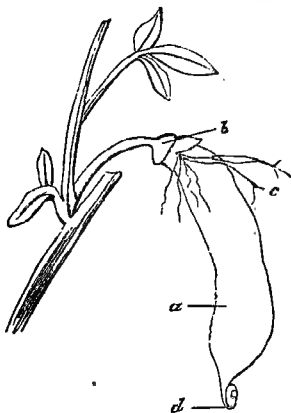


FIG. 33.—Pod or Legume of common Broom. *a*, legume; *b*, persistent calyx; *c*, remains of stamens; *d*, remains of stigma.

round, as it were, the pistil which in the broom (Fig. 32) has a peculiar curve. This pistil enlarges into the seed-pod or legume (Fig. 33), and from this

form of seed-vessel the whole of these vetch and pea plants have taken their family name of Leguminous Plants; albeit they have another name, taken from the fancied resemblance of some of the pea-blossoms to a butterfly, and hence they are sometimes called Papilionaceous Plants. The peculiar form of these butterfly-like petals has procured for them the names which are appended to the figure (Fig. 31). You can scarcely see one of these leguminous plants again without knowing its social status in the botanical world, and recognizing it as a member of a very important family—quite one of the most so in Flora's kingdom. Most important to man, seeing that from it he draws such a number of articles which are almost indispensable to his comfortable existence. The trefoils or clovers, the vetches and the lucerne which fodder his cattle, and the peas, beans, lentils and pulses which feed himself, all come from the leguminous or pod-bearing tribe; the valuable dyes, indigo and logwood, and the drugs gum-arabic, senna, and catechu are likewise its products. Lastly, look at the leaves of our leguminous friends (Fig. 34); but of these we shall speak in a future lesson. Suffice it to point out here that they are what botanists call compound, that they are characteristic as such, especially with the superaddition, to many, of the tendrils (Fig. 34).

With distinct petals, with petals and stamens

attached to the calyx, the rose tribes are grouped with our pod-bearing friends the Leguminosæ; but from them, in other respects, they differ widely.

In the first place, the blossoms are regular; you can cut a strawberry, a wild-rose, or an apple blos-

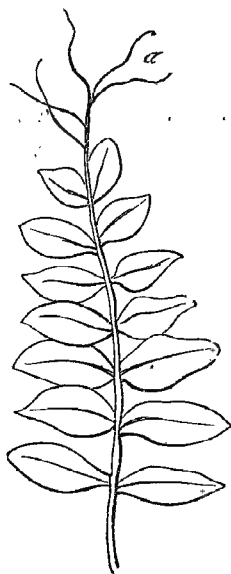


FIG. 34.—Compound Leaf of Vetch. *a*, tendrils.

som through the centre, in any direction, into two equal halves. Calyx, corolla, stamens, pistil, varying in divisions, number, etc., are yet all regular. You will have no difficulty with the first three sets of organs in any we have made you gather; but when you come to put the pistil, or rather pistils, of the

strawberry and bramble beside those of the apple or wild rose, you are probably quite thrown out. The strawberry and the bramble (Fig. 28, 29) bear their pistils relatively to the other parts of the blossom, in accordance with your previous experience of plant arrangements; but the rose and the apple seem to put their calyx and other parts right on the top of the pistil, or at least of the seed-vessel. We are too young in our lessons to consider this subject here; suffice it that the difference is more apparent than real. It is, however, sufficient difference to cause divisions in the great class of the Rosaceous plants; some claiming to be the true stock, or Roseæ, whilst others, including our friends the apples and pears, rank as the Pome tribe, and a third set take their places with the cherries and plums. Nevertheless, divided or not, the Rosaceæ are a most excellent family, and are not one whit behind the pod-bearers in the amount of good things they prepare for us. The queen of flowers herself heads the procession, and though her train includes many a sweet blossom, the great *forte* of her tribe lies in the fruits,—strawberries and raspberries, apple and pear, almond, and plum, and peach all belong to the clan of Queen Rose; and even these must be ushered in with flowers, for truly the blushing apple-blossom and the snowy clusters of pear and cherry bloom would be thought more of but for

the fruits that follow them. Neither must we forget that with all the good things they give us, they are also great preparers of prussic acid, and that bitter almonds, peach kernels, and even apple pips, contain it in abundance. True Rosaceans, however, are less given to this manufacture, and

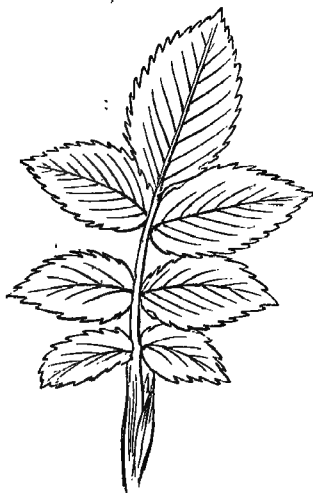


FIG. 35.—Compound Leaf of Rose.

offer us astringency in its place. Many members of the rose tribe, like the rose itself (Fig. 35), have compound leaves.

Group No. 3, in our hand, greets us with the very different aspect of the hemlock tribe (Fig. 30). We find, on examination, the bond of union in the attachment of the petals and stamens, but almost

all else is different. First, there is the great distinctive feature which gives the family name of umbel-bearers to this large section of the vegetable kingdom; an umbel being that peculiar disposition of the flowers which we see in Fig. 30, and which we find in all plants belonging to the order. Observe how the flower-stems all spring from one central point. You will seldom gather these hem-

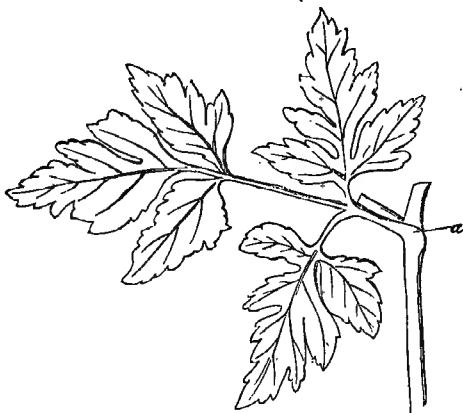


FIG. 36.—Compound Leaf of Umbelliferous Plant. *a*, sheath for stem.

lock-like plants with flowers otherwise than white, though some have a pinkish tinge, and one or two are yellow; moreover, we have compound leaves again (Fig. 36), but compound after a different mode from the leaves of the vetch, or of the rose; the leaf, too, sheaths the stem at its base, and the stem is more or less hollow. Look to these things,

for they are part of your lesson, and then let us see to the blossoms themselves. Here, perhaps, you do not see matters quite so plainly as you did in the large-blossom plants we have hitherto examined; a little more patience is required, and the magnifying glass will aid you. Do not forget we are still among the distinct petal flowers. Five:

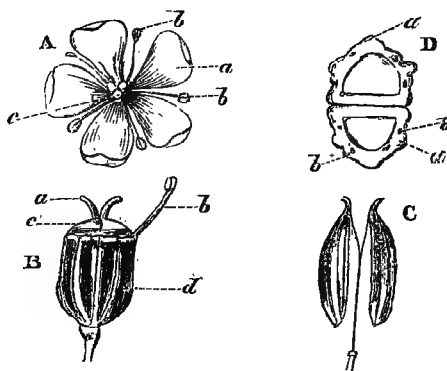


FIG. 37.—A, Blossom of Umbelliferous Plant: *a*, petal, with inflected point; *b*, stamens; *c*, pistil with double style. B, Fruit of Umbelliferous Plant: *a*, styles; *b*, stamen; *c*, a fleshy disk; *d*, double fruit. C, Ripe Seeds or Carpels separating from central axis. D, Section of Seeds: *a*, ribs; *b*, oil-channels, or *vittæ*.

little petals have these umbellifers, placed on the top of what you will recognize as the seed—seed-vessel it is indeed (Fig. 37)—and with a calyx, more or less minute, adhering closely to the latter. On the summit of this little double seed, you will more easily make out the double styles, and the five.

stamens will not tax your patience much. Probably, before your examination has proceeded thus far, you will have made the discovery that the petals of this tribe of plants are by no means equal in size, in all cases, and, if you have examined closely, that they have frequently a peculiar turning in—inflexion—at the top (Fig. 37). We could say much respecting the seeds (Fig. 37) of this extensive plant family, but that belongs to the fruit department; only, if you have opportunity, glance at them now when somewhat advanced towards ripening. A very cursory examination will show you how different the small, double, ribbed, and often aromatic seed is from those which have hitherto come under our notice. The caraway seed is an excellent specimen. Many drugs and aromatics, and vegetables such as carrot, parsnip, celery, parsley, are yielded to us by the umbel-bearers.

Scarcely would it be possible to place in your hand representatives of orders of plants more important or more interesting than the triad of which we have endeavoured to give you some idea, and perhaps we could not well select orders possessing characters more likely to impress themselves upon the mind of a beginner in the study of botany. Look, then, again and again at the pea tribe flowers, or weeds if you will, at those of the roses and of the umbel bearers, for they are most distinct and natural in their markings, and well calcu-

lated to form foundation lines for your future knowledge,

We mentioned the white meadow saxifrage and the willow herb as included in our present handful of weeds. To such as know them by their familiar names they will offer examples of other, but perhaps less strongly marked, plant families, which still have the distinct-petal character and the calycine attachment of stamen and petal. The white meadow saxifrage is an elegant plant, often found very abundantly during May, bearing its collection of white blossoms on a stem from four to six inches high, and springing from a root which seems made up of a number of bead-like granules, the size of small peas. It represents well a plant family, the Saxifrages, which contains many beautiful members, but from which man draws but little that is useful. The willow herbs are still more common than the saxifrages, and towards the end of June, and in July, are to be found by nearly every hedge-side—at least the lesser species with their small pink flowers. A little later, the great hairy willow herb of our ditches and ponds offers its handsome, large, rose-coloured blossoms. If you know the plants, or can find them, you will recognize the same structural arrangement of petal and stamen that we have dwelt so much upon, and when you come to examine the pistil (Fig. 38) you get another variety of the organ; for here the stigma





Two-flowered Linnaea.



Square-stalked St. John's Wort.



Spotted Rock-rose.



Hispid Mallow.

is elegantly cleft into four divisions. The fruiting and seeding of these willow herbs are peculiar ; but of that hereafter.

The parts of plants to which, in these our early lessons, we have more especially directed your attention, are all included in the term Reproductive



FIG. 38.—a, Four-cleft stigma of willow herb.

Organs—that is to say, they are such as conduce to the formation of the seed upon which the continuation and reproduction of the plant species depend. The calyx, the corolla, the stamens, the pistil, make up what we commonly understand as a flower, and without a flower there can be no seed ; but a botanist's flower and a florist's flower are two very different things. The florist requires gay colouring and fine petals, and cares but little for stamen or pistil ; the botanist looks to the latter only as the *essentials* of *his* flower—in other words, these organs are all that are required for the production of seed, and are therefore the *essential reproductive* organs ; indeed, in some plants we find no flowering beyond the stamen and pistil development.

“ God might have made the earth bring forth  
Enough for great and small ;  
The oak-tree and the cedar-tree,  
Without a flower at all.

“ He might have made enough, enough,  
For every want of ours ;  
For medicine, luxury, and toil,  
And yet have made no flowers.”

And truth it is that, for aught we can see, we might have had all essential means of seed production without that beauty which He who made all things has lavished upon the lilies of the field. Calyx and corolla are apparently non-essential to seeding, and yet we cannot but imagine that they subserve some office of greater or less importance beyond delighting the eye.

#### THE CALYX

Of a plant has its first office in the protection of the flower-bud—covering the tender organs within, until their time for full expansion has come. Then it assumes various modes of procedure. We have seen, as in the poppy (Fig. 39), it may be cast off as the blossom opens, separating in one piece like an extinguisher, and allowing the petals, which seem to have been crumpled up within it, to expand in their full size and beauty.

More generally, however, the calyx remains for a longer or shorter time after the flower blows, and in many plants it is still there after the petals of

the corolla have fallen, either protecting the growing seed-vessel, or forming part of what people generally call the fruit itself. The latter we find to be the case in the apple, the pear, the thorn, the fruit



FIG. 39.—Poppy-bud drooping before flowering, and casting off two-pieced calyx.

of these being partly composed of the enlarged calyx. When a calyx falls off early, it is called a *deciduous* calyx; when it remains till the fruit has formed, it is called *persistent*.

As yet, our calyces have been green or leaf-like organs, more or less regular, and easy of recognition. You must not, however, expect always to find them bearing this palpable character; they are often very irregular in form, sometimes in one piece, sometimes in two, sometimes in more. Neither is the calyx always green: of this we have had some notice in the frequently deep-coloured flower-cup of the wallflower, or yellow bivalve of the gorse, though, in these instances, it preserves its well-marked distinction from the brighter corolla. But there are cases where, although the corolla

exists, it is so insignificant as to be entirely eclipsed by the more brilliant calyx—such we find in the hellebores or Christmas roses of our gardens; and, lastly, as in the anemones, the corolla may be absent altogether, and its place supplied by a calyx as beautiful as any corolla. In such cases the calyx is called *petaloid* or *flower-like*. The crocus and the snowdrop likewise offer us examples of the petaloid calyx, and in such plants the entire flower, composed of petals and sepals, is frequently called the *perianth*. When the calyx is joined together so as to constitute a one-pieced or *monosepalous* calyx, its composition of several conjoined parts is usually indicated by toothings, foldings, or marking, as we shall see in the primrose. Lastly, the calyx is frequently irregular in form; in this respect generally being coincident with irregularity of form in the corolla it encloses. Did space permit, we might enlarge greatly upon the variety of forms to be found in calyces, but now that our readers can recognize the part for themselves, it is better that they should seek out their knowledge by looking at every plant or weed for that variation—and beautiful variation too—which they will not fail to find.

One last word over our flower-cups. You will not long have examined plants before you meet, every now and then, with a calyx which looks rather like a collection of the ordinary leaves of the plant, than like an orderly, well-conducted calyx.

This is especially remarkable among the roses and the primrose tribe, and it is, in fact, an effort of the calyx to metamorphose itself back to its original leaf-type. This is a subject of plant lore, however, which, only hinted at now, may engage your attention at some future time.

#### COROLLA.

Calyx first, next within comes the corolla, regular or irregular in form, in many pieces or petals, as we have met with hitherto, or in one piece as we shall come upon it ere long. Now, before we take the flower in its full expanse of beauty, let us give short attention to it whilst yet in its baby state, cradled within its calyx. Take any common flowers or weeds you know, or, for that matter, that you may not know by name; open their buds—tear them open if you will, but also cut them in various directions with a sharp knife; see how beautifully packed within are these petals, which, next day, or hour even, are to open in all their expanded pride, without a crease or fold upon them. These poppy petals that we spoke of a little above, look really and truly crumpled up, and yet in the expanded blossom not a trace remains of such usage. This bud-packing is known, botanically, as the *æstivation* of flowers, and the term is applicable to calyx as well as corolla, for the calyx, you will find, has its set forms of bud-

ding. Like the calyx, the corolla, when it is joined up into one piece, as it is in the primrose, the harebell or bluebell, or in the blue veronica, indicates its many-pieced origin by the divisions, more or less deep, which are marked upon it; these divisions bearing the same position, relatively, to the divisions of the calyx that distinct petals do—that is to say, the corolla petals or divisions are placed in alternation with the calyx sepals, or divisions, not opposite. Mark the fact, as we shall have to return to it.

The forms of the corolla are exceedingly numerous; the crucifer or cross-like, the papilionaceous or butterfly-like, and the rosaceous we have already seen, but to these we must add the labiated, as we shall see it in the common white nettle, the bell shape of the bluebell, the wheel shape of the forget-me-not, and the strap-shaped little florets of the dandelion, or of the white ray of the daisy. Moreover, as if height, colour, and varied and lovely form were not enough, you will find many a blossom ornamented with other appendages, such as hairs, glands, coronets, etc., which add to its beauty. Go and see.

#### STAMENS.

Within the corolla, and, when definite in number, alternating with its divisions, in the perfect flower, we have the stamens, those important

organs which, along with the pistil, constitute the essential reproductive organs. You have already examined common plants enough to be aware that the stamens are not by any means definite in number, but occur in every proportion, from the many of the buttercup or rose to the few of the wallflower or the umbellifer. But if varied in number, they are far from being so in form (Fig. 40). The filament, or support of the anther, may



FIG. 40.—Stamen. *a*, anther; *b*, filament; *c* pollen.

be absent without injury to the utility of the organ; in other words, the anther is the essential part. Examine the latter attentively, using a lens if possible. You will quickly see that almost invariably this anther is composed of two lobes; and if you extend your observations, you will see that from each of these lobes, which are in reality little pouches, is discharged a fine yellow dust. Shake your flowers over a dark surface, and if the anthers

be ripe, this pollen dust will come out in a golden shower. Dust it looks, but dust it is not; for if you get it sufficiently highly magnified, you will find it to consist of multitudes of minute bead-like grains, generally round, but sometimes oval or triangular. When ripe, shaken or not, the anthers discharge their pollen by a regular mode of opening, or, as it is called, *dehiscence*; this opening, in most cases, taking place along a line of *suture*, but in some instances by means of pores or valves. The very abundance of the pollen contents of these anthers testifies to its importance; without it, plant perpetuation does not take place. But before we get upon that subject, we must make further acquaintance than we have done yet with the other essential organ of reproduction, and for this we must look to the centre of the flower.

#### THE PISTIL

Is the central organ of the blossom, the seed-bearer. You will find, indeed you must have found already, the pistil much more varied in form than the stamens. In the buttercup it is made up of many members; in the poppy it consists, apparently, of but one; in the leguminous plants of one; in the umbellifers of two; in the rosaceans apparently of one in some cases, of many in others. In short, there is no end to the varieties of pistil, and such you will find the case as you go on

examining blossom after blossom, as of course you will do. This seed-bearing, seed-developing pistil is composed of three parts—the ovary or seed-vessel, the style, and the stigma. Of these, two are essential, the stigma and the seed-vessel; but the style, though usually present, may, apparently, as in the poppy, where the stigma lies close upon the top of the ovary, be dispensed with. Indeed, the style, like the filament of the stamen, appears to be simply a mechanical addition to essential parts, to fit them for their relative positions in the

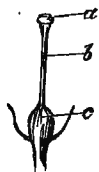


FIG. 41.—Pistil of Primrose. *a*, stigma; *b*, style; *c*, ovary.

blossom. As you will find, in a future lesson, the entire plant is covered with a thin skin, or *epidermis*, as it is called; and only at one point is this wanting, that point being the stigma of the pistil, which, instead of epidermis, is coated with a glutinous matter, to which adhere the grains of pollen as they are discharged from the anther. The adhering grains convey to the ovules within the seed-vessel the power of becoming perfect seeds, for it is a rule, seemingly without exception, that if there is no pollen, no seeds are formed. In the

majority of plants, the stamens and the pistils are found combined in the same blossom; but in some, such as the lychnis, which we gathered into Handful No. 1, they are not only in separate blossoms, but in separate plants, perhaps widely separated. Is it not a great chance that the pollen of the one blossom reaches the stigma of the other? If it depended on chance it would be; but He who

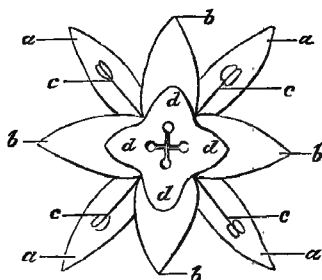


FIG. 42.—Diagram of a perfect flower. *a a*, calycine, or external whorl, of organs alternating with *b b*, corolline whorl; *c c*, staminal whorl, opposite calycine divisions, alternate with corolline; *d d*, pistiline whorl, opposite corolline, alternating with staminal and calycine.

separated the blossoms has made also the provision that they do not bloom in vain. Watch that bee who is coming away from the stamen-bearing lychnis flower, and carrying with him a golden embroidery of pollen; why, the very next thing • he does is to fly off to that blossom which is waiting for it, and rub his spangled jacket against it. Neither is it bees only which are the pollen carriers,

for other insects, doubtless, are equally useful : and there exist well-authenticated instances of pollen thus being carried many miles to its destined use.

Remember, however, that the pollen of a rose will not fertilize a wallflower, nor that of a hemlock a poppy ; like must to like, and that it will to like renders it needful for the seed-grower and nurseryman to be very careful in his way. Allied plants, such as cabbage, cauliflower, broccoli, etc., do intermingle in their fertilization, and, as a consequence, a choice variety may be deteriorated or lost by the flowering of other varieties of the same family in its immediate neighbourhood. However, this is digression. To go back to the stigma and its varied forms ; we have already alluded to the four-cleft organ of the willow herb, now look at the harebell or campanula, and it is three-cleft ; find it out in the grasses, and it is an elegant feather ; in the primrose, a little knob like a pin's head.

We have already remarked that the organs of the flower were *essential* and non-essential with reference to the production of seed, the essential being the stamen and pistil. Nevertheless, the botanist regards that blossom only as the type of a perfect flower which possesses calyx and corolla, stamens and pistils fully developed ; a lychnis wanting in one blossom the pistil, in another the stamens, or the anemones with a petaloid calyx

instead of corolla, are not perfect flowers, botanically speaking. Be it remarked, too, that not only must these parts be present, but they must be developed in a regular series of circles, or *whorls*, as they are called, the organs alternating one with the other; the corolla divisions alternating with those of the calyx, the stamens with the divisions of the corolla on the one side, and with the parts of the pistil on the other (Fig. 42). These relative positions are, of course, altered by variations in number and development, but still they afford to botanists a standard by which to judge in the determination of doubtful parts.

## Handful III.

*The Plants of the Handful—Honeysuckle and Bluebell, Daisy, Thistles, Wild Chamomile, Ragwort, and Colt's foot—Elder Flower—The Bedstraws—The one-pieced, or one-petaled or Monopetalous Corolla—Composite Blossoms—The Composite Family—Inflorescence—The Scape and Rachis—The Capitulum—The Spike—Axillary Flowers—The Raceme—The Umbel—The Panicle—The Catkin—The Whorl—Glomerulus, Spathe, and Cyme—Bracts.*



### HANDFUL III.

“ Their heads

Flowers raise, to greet the sun ; and man, too, lifts  
His thankful soul to God for all these summer gifts.”

CALDER CAMPBELL.

WHAT have we ? Honeysuckle, certainly, by the scent, before we see it, and the “ bonny bluebell,” and the “ wee, modest, crimson-tipped ” daisy, that Burns wrote of, and that Chaucer well-nigh worshipped as well as wrote of. These are almost enough to make a handful of themselves. But mind your fingers, for there should be prickly thistles amid our gathering this time, and the great ox-eye, or, as it is called in some places, horse-daisy, and one of those plants which children call wild chamomile (Fig. 43), and the yellow ragwort (Fig. 44), with early spring colt’s-foot, dandelion, and a bunch of elder flowers. We will not pay our readers the bad compliment to suppose they do not know every plant we have just named ; probably, too, they can tell the bedstraws and the woodruff,

with their leaves placed round their stems in what is called a *whorl*, as shown in Fig. 45. These last do not add much to the appearance of our Handful ;



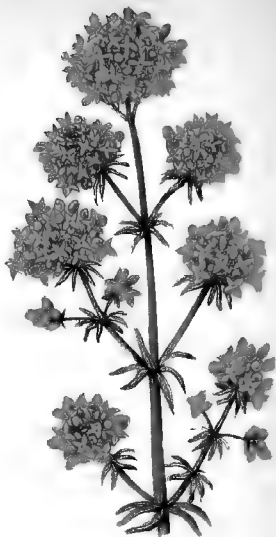
FIG. 43.—Blossom of common Wild Chamomile. *a*, disk ; *b*, ray ; *c*, peduncle. The leaves are divided into capillary or hair-like segments. Inflorescence definite.

but should you chance to cast your plants aside for a few days, you will find that the woodruff has, in withering, developed its sweet, new-mown hay odour, more especially so if you are pressing it in





Germander Speedwell.



Yellow Bedstraw.



Wood Hawkweed.



Ivy-leaved Bell-flower.

paper; the other flowers having quite lost their scent.



FIG. 44.—Blossoms of common Ragwort. The inflorescence is definite, and arranged in a corymb.

You look at the blossoms of the honeysuckle (Fig. 46), the bluebell (Fig. 47), the elder, and, if

you have a good magnifier, at those of the bed-straws and woodruff, and you quickly discover that we have left the domain of the many-petaled flowers, and reached that section where the corolla is all in one piece. (See Fig. 46.) If you attempt to re-

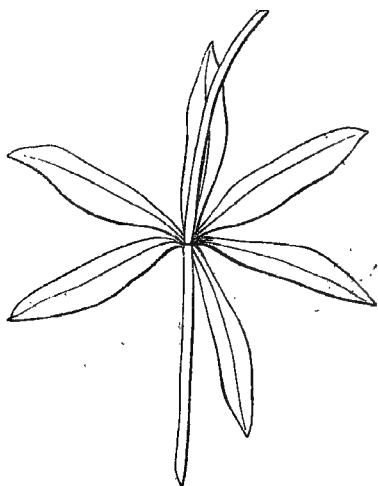


FIG. 45.—Leaves of common Woodruff, arranged in a Whorl.

move it, it must either come away all in a piece, or it must tear; only you cannot understand why the daisy, the thistle, the ragwort (Fig. 44), and such like plants, find their place here, for truly they seem made up of pieces enough. We will get to them presently.

Now these plants in our hand have one bond of

connection with those we gathered into Handful II. They belong to what is called the "Calycifloral" section; in other words, their stamens and corolla are inserted upon the calyx, and not, like the flowers in Handful I., upon the receptacle. Moreover, the plants we are now examining have their corolla and

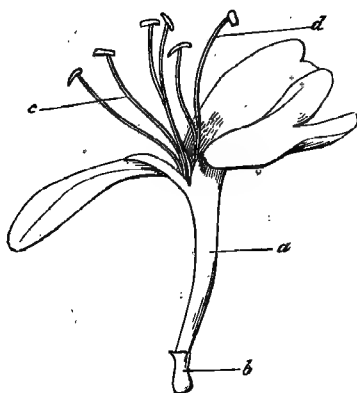


FIG. 46.—Blossom of common Honeysuckle, in one piece, or monopetalous.  
*a*, corolla; *b*, calyx; *c*, stamens; *d*, pistil.

stamens (Figs. 46 and 47) fixed, as it were, on the top of the ovary, as in the case of the true roses and the pome tribe, and also the umbellifers in many-petaled calycifloræ; this being due in all these cases to the calyx growing up, as it were, around, and thus inclosing the ovary; to speak botanically, being "adnate" to it. The corolla and stamens, however, are just as much inserted into

the calyx in these cases as they are in the strawberry and the bramble (Fig. 29A). Thus, then, we have our present section of plants marked off from

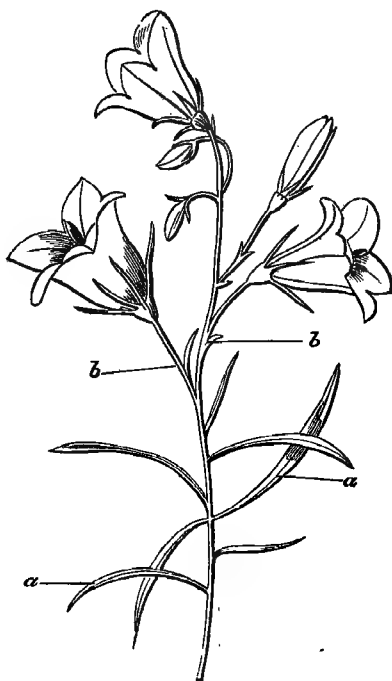


FIG. 47.—Blossoms of common Bluebell, or Harebell. The inflorescence is arranged in a panicle. *a a*, leaves of plant; *b b*, bracts.

all others; they are distinct from the many-petaled, and they are no less distinct from their monopetaled

or one-petaled brethren, which have corolla and stamens inserted into the receptacle beneath the



FIG. 48.—Fruit of common Elder, arranged in a cyme.

pistil, pistils, or ovary, like the buttercups and poppies.

Not much is it our honeysuckles do for us in the

way of the "utile," but in the "dulce" they are pre-eminent; for what would English hedgerows be in June without their twining woodbines, and what would Scottish braes be in July without their own bluebells, that every summer-straying bairn fills her hands with? How very different from the honeysuckle are the latter (Fig. 47), but yet how akin the parts of likeness for which we have taken them together. Look at one of the flowers from the bunch of elder blossoms, which is so like your old friends of the hemlock or umbellifer tribe; its one-pieced corolla springs from the top of the seed-vessel, which seed-vessel (Fig. 48) albeit will be a black elderberry in September, and its juice, mayhap, form one drop in the cup of hot spiced wine that good housewives delight in. Now, we give you credit for understanding the preceding explanations, but we can see that ever and anon you are puzzling to know what thistles, and daisies, and colt's-foot do here, reminded, perhaps, every now and then, by the prickly remembrances of the former as you grasp your flowers.

Take any one of these last-named plants you like, say the colt's-foot, which will probably greet us first in early spring with its yellow-rayed blossom, and let out farming secrets. However, pull the flower's head to pieces, and what do you find? Not a number of distinct petals, but a numerous company of little flowers, or rather florets (Fig. 49),

each with its one little ovary or seed, and the little feathery surroundings which represent the calyx; for bear in mind that the green covering which incloses the buds (Fig. 49, *d*) and holds the expanded flower is not a calyx; but of that more hereafter. Look at your dissected colt's-foot blos-

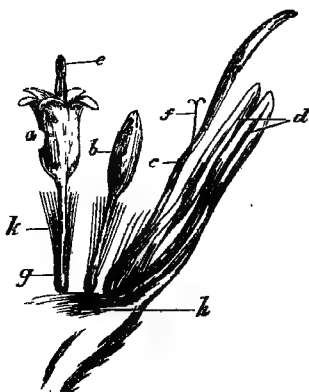


FIG. 49.—Greatly-magnified view of three florets of common Colt's-foot. *a*, tubular floret of disk, with both stamens and pistil, *e*; *b*, bud; *c*, strap-shaped floret of ray, without stamens, but with pistil, *f*; *d*, bracts of involucre; *g*, seed or achene, surrounded by the feathery calyx or pappus, *k*; *h*, common receptacle.

som again with your magnifying-lens, or, failing the blossom, at the figure. The first thing that will strike you is, that the little florets in the middle are very different from those at the circumference (Fig. 49, *a*, *c*). The little central flower is as perfect, aye, and as beautiful, a little flower as can be, except that its calyx is not quite after the

usual fashion. Its pistil extrudes from its centre (Fig. 49, *e*) and the little stamens form a tube round it.

Botanically, these little central florets are called the florets of the disk, in contradistinction to those at the circumference, which are called the florets of the ray (Fig. 49, *c*). These last, as you at once see, are not regular, symmetrical flowers like those of the disk, but are long and "strap-shaped." Moreover, they have a pistil of their own (Fig. 49, *f*), ovary, and feathery calyx or "pappus," but no stamens, their florets depending for their fertilization upon the stamens of the disk, as well they may.

Now, this colt's-foot blossom is a most excellent example of this tribe of plants, the Composites, which, for all their appearance belied them, have, you see, one-pieced blossoms after all, only the blossoms are collected into a close head or *capitulum*, instead of being spread over a stem or peduncle. The part on which the florets are placed (Figs. 49, *h*, and 50, *b*), and which represents the peduncle, is called in these plants the *receptacle*; and the green envelope which represents the leaves of the peduncle, or *bracts*, is called the *involucre* (Figs. 49, *h*, and 51, *b*).

You must not run away with the idea, however, that all our composite heads of flowers are exactly similar to the colt's-foot. In the daisy, in the rag-

wort (Fig. 44), in the wild chamomile (Fig. 43), you will find them similar ; but not so in the hawkweed (Fig. 51) or in the dandelion, which should not have waited our special mention until now. In the latter, the florets are all strap-shaped, like those of the colt's-foot ray ; whilst in the thistle (Fig. 50), and other allied composites, they are all tubular, like those of the colt's-foot disk.

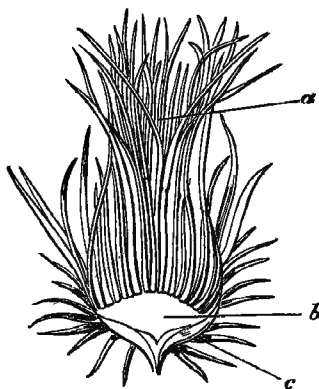


FIG. 50.—Section of Head, or Capitulum, of common Thistle. *a*, florets ; *b*, common receptacle ; *c*, bracts, or involucre.

It will be an excellent lesson and exercise for you to gather these composite blossoms and examine them. You must expect, in doing so, to find considerable variation in the distribution of the stamens and pistils in the tiny florets. The composites form such an extensive family, that botanists are fain to divide them, according to these floret distinctions,

into tribes, whereof the lettuces, dandelion, hawkweed, etc., belong to one, the thistles and burdocks to another, the daisy, ragwort, colt's-foot, and many another to the third.

We have already alluded to the peculiar form which the calyx—not the involucre, remember—assumes in the composite family; feathery in a

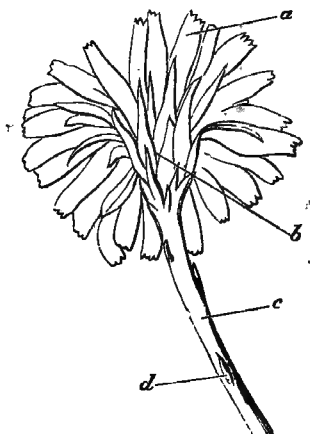


FIG. 51.—Back view of blossom of common Hawkweed. *a*, strap-shaped florets of ray; *b*, bracts, constituting the common involucre; *c*, peduncle; *d*, scale.

greater or less degree, as familiar to us all, in thistle-down, and in the dandelion parachute, and botanically called the pappus, it remains after the floret has withered and fallen off, and until the ripened seed calls for its aid to transport it far from the parent plant. Something more of this aerial seed-sowing may we learn if we give careful attention to

these plants when fruiting. It is not all composites, however, which have these feathery wings; the daisy, the chamomile, the chrysanthemum, and others, have none, or at best a few tiny scales, to show where they should be.

Both in the way of food and medicine, the composites, of which we have examined these few representatives, yield largely to man. The prevailing principle is a bitter, sometimes, as in the wormwood, aromatic, or, as in the lettuce, narcotic to an extent which makes itself known even in the cultivated vegetables, and is strong in some of the uncultivated species. Dahlias, asters, cinerarias, purple groundsel, the everlastings, are a few of the many brilliant flowers this great family offers to us.

The elder, which we lately mentioned, belongs to the same tribe as the honeysuckle, whilst the woodruff and bedstraws represent to us the madders, their most remarkable features being the "whorled" disposition of the leaves around the stem (Fig. 45). The bedstraws have some of them white, others have yellow flowers; the flowers of the woodruff are small, but brilliant white, and those of the little field-madder are pink. Tiny corollas are they all, but elegantly cruciform in shape. If you have the patience to dissect them under your lens you will find the stamens fixed to the corolla, and the corolla to the calyx. No lens do you need, however, to look at the bluebells, the representatives of the

campanula tribe, and you easily make out that the same floral structure which has grouped our Handful prevails with them; the stamens, however, are not attached to the corolla, and the stigma is lobed.

In the lesson which we appended to Handful II., we endeavoured to give you some idea of the parts of a perfect flower, their uses and arrangement; we have now to go a step further, and say somewhat of the methods according to which flowers are arranged upon the plants which bear them. Perhaps it never occurred to many of our novice readers that flowers are arranged upon their stems in any definite way. They know that their mignonette grows in a little pyramid, their Tom Thumb geraniums and calceolarias in sorts of bunches, and so on, and suppose there is some sort of set fashion for them; but as to what it is, they have not the most remote idea. Let us see whether we cannot make our few wayside weeds give us a clue to unravel, in some degree at least, flower arrangements, or, as it is called in botany,

#### THE INFLORESCENCE.

We need scarcely remark that flowers, and blossoms generally, are supported upon a stalk or stem of some kind. In certain instances there is but one flower to a stem, as in the primrose, the snowdrop, etc.; in others, the blossoms are crowded on by

hundreds and thousands, and in every variety of form and arrangement. Now this primary or main flower-stem goes by the general name of *peduncle*, and when, as often occurs, other little stems are



FIG. 52.—Flower-spikes and Leaves of common Plantain. The peduncle springing from the root-crown is called a scape. It might also be called a rachis, because of its running straight to the extremity of the inflorescence.

given off from it, they are known by the diminutive of *pedicels*, or little stems. When the peduncle springs direct from the root-crown, or root-leaves; and, unbranched, bears a single blossom, it is called

a *scape*; but it also bears the name of *scape* when, as in the daisy, the dandelion, the plantain (Fig. 52), the cowslip, or oxslip, it carries a collection of blossoms. Indeed, the latter plants, although their flowers are differently arranged, approach very near the primrose in their inflorescence, and we have only to imagine the primrose scapes bound to-

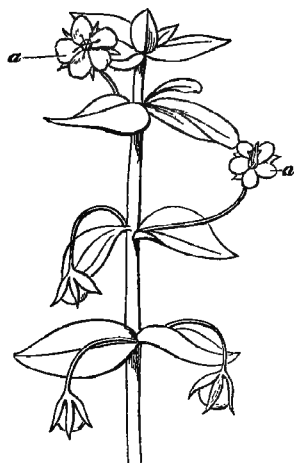


FIG. 53.—Spray of common Scarlet Pimpernel. *a a*, blossoms, solitary, springing from the axils of the leaves, which are thence called bracts.

gether part way up, to get the first transition to a compound form of flowering. Again, let us do away with the pedicels of the cowslip blossoms, and mass these together upon the top of the scape, and we get the *head*, or *capitulum*, such as we see in the daisy and other composites, or, reversing the



Cross leaved Heath.



Cornish Heath.



Cranberry.



Fine-leaved Heath.



process, prolong the scape, and plant the blossoms closely along it, still keeping away the pedicels, and we have the spike such as we see in the common plantain (Fig. 52), the main stem still retaining the name of scape. In this case it might



FIG. 54.—Fine-leaved Heath. Blossoms disposed in a raceme and partly whorled.

also be called the *rachis*, another term for a stem, but for one which runs in a straight line from their base through the centre of the inflorescence.

Of course, however, the majority of plants, as our readers are well aware, have not the stems thus

rising from amid their root-leaves, and the umbel, the spike, or the capitulum, and any other forms of inflorescence may occur in connection with other peduncles than scapes; and, on the other hand, solitary blossoms do not necessarily claim scapes for their supports.

Look at Fig. 53, which represents a sprig of the common scarlet pimpernel, a common enough weed,



FIG. 55.—Sprig of common Currant. Blossoms in a pendent raceme.

though we have not yet placed it in your hand; the flowers spring all the way up the stem, but each is solitary on its own peduncle, and starts from the junction of the stem with a leaf, or, as it is called, from the axilla of the leaf, the blossoms being described as solitary and axillary. But these leaves, from the axils of which the flowers spring, might be greatly diminished in size, might be dwindled

down to little more than scales, and the peduncles might be shortened; in which case we should have such a form of flower arrangement as we see at Fig. 54, forming what is called a *raceme*. The raceme is one of those most common forms of inflorescence, and may be erect (as in Fig. 54), or drooping, as in the currant (Fig. 55). Now suppose, instead of these little pedicels of the raceme blossoms being all the same length, we have the upper or central ones short, and the lower or outer ones prolonged so as to bring the blossoms nearly to the same level, we have a *corymb*, as in the bramble (see Fig. 29, p. 35); but if we take a corymb, and, as it were, draw it out from the centre, we again get the raceme—a change of form of inflorescence which actually occurs in the floral development of such plants as the wallflower and other crucifers, only that in these cases the little scales, or *bracts*, necessary to the true raceme, are wanting. Once more let us have all our pedicels springing from one point, and we have the true umbel (Fig. 30, p. 37), which may be simple, or, as in the figure, compound, the secondary umbels of the compound form being named *umbellules*, or little umbels. As already alluded to, it is only requisite to concentrate the flowers of the umbel to get the head of the composite. When a raceme, still retaining the raceme character, becomes branched, we get the *panicle*, which is the common flowering

form of most of the grasses (Fig. 56), differing, however, greatly in the compactness or diffuseness of its arrangement. Many grasses, such as wheat,

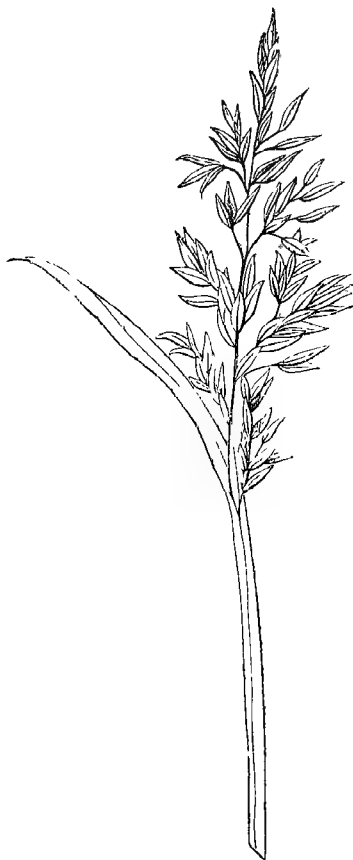


FIG. 56.—Panicked Inflorescence of Grass.



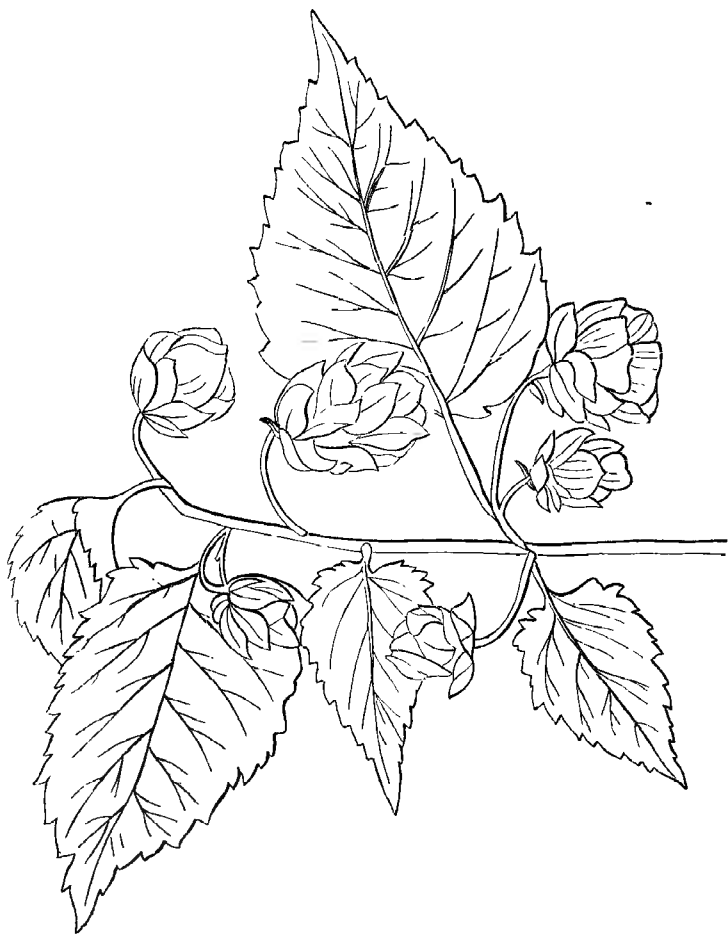


FIG. 57.—Fertile Blossoms of common Hop. *a*, sealy flowers arranged in a catkin; when ripe named a strobilus.

barley, darnel-grass, etc., have the true spiked form of flowering, each spike being made up of numerous spikelets (*locustæ*) ; and these, as we shall see when we come to examine grasses, are made up of a larger or smaller number of blossoms. The peduncle of the grass is often called the *rachis*, and



FIG. 58.—Red Dead Nettle ; the blossoms disposed in whorls or verticillasters.

the stem is a *culm*. When a spike of flowers droops, as it does in the poplar, hazel, etc., it is called a *catkin*, and the fertile flower of the hop (Fig. 57) gets the same name. When in our next Handful you make acquaintance with the mint or

labiate tribe of plants, to which the common red or dead nettle (Fig. 58) belongs, you will find a still different flowering plan; for the blossoms are collected closely round the stem, in the leaf axils, in



FIG. 59.—Common Stinging Nettle. Inflorescence in a glomerulus.

little bundles properly called verticillasters, but often described as whorls. The stinging nettle (Fig. 59), not the slightest connection, not even a “Scotch cousin,” of its namesake, has its flowers—

some of our readers stare at the idea—in little clusters, each one of which constitutes a *glomerulus*. One of the most unique forms of inflorescence, however, is the *spathe* (Fig. 60), which is composed of an assemblage of blossoms inclosed within a sort of sheath or hood; as in the wake-robin—lords and ladies—so common by English hedge-sides in early spring; most English children know it, and will readily recognize what is meant. Almost we fear to bewilder you with these varied names and descriptions, which it is difficult to make attractive to a beginner, though it is well to get some knowledge of them. Only one more, and we have done. Look at Fig. 48, which illustrates the fruit-cluster of the common elder; it is neither umbel, corymb, nor raceme, but seems a mixture of all three, and gets the name of *cyme*. It is most near the corymb, however, in form, and derives its principal diversity from the order in which its blossoms become developed and expanded; albeit this brings us to another subject connected with inflorescence—the order of expansion of blossoms, whether definite or indefinite, whether tending towards the centre of the floral axis or centre, or tending away from it. It is, perhaps, better, in these our early days of weed-gathering, not to puzzle you with this subject; it is scarcely requisite for our first lessons, which we are bound in good faith to keep as simple for you as possible. Look back to Fig. 53, the

sprig of scarlet pimpernel: the solitary flowers spring from the axils of what we called leaves, but

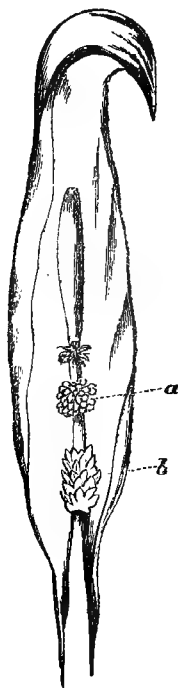


FIG. 60.—Reproductive Organs, or Flower of common "Wake-robin," inclosed in a large bract, called a spathe. *a*, stamens; *b*, pistils.

leaves they are not in the eye of a botanist, for their proper designation is

#### BRACTS.

In many instances, as in the one in question, the bracts are scarcely, if at all, distinguishable

from the ordinary leaves of the plant. This is more especially the case with the lower bracts of a flower series, for the upper ones become less leaf-like. Nevertheless, whether in every respect like an ordinary leaf, or whether not more than an insignificant scale, the appendage at the base of a peduncle or pedicel is always known as the bract.

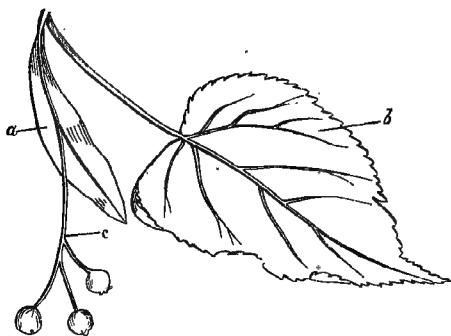


FIG. 61.—Twig of Lime-tree. *a*, bract; *b*, leaf; *c*, fruit.

Refer back to the various figures with which the present paper and those preceding are illustrated, and you will find numerous instances of bracts.

At times, however, bracts, or collections of bracts, are called *involucres*, when they envelope such collections of blossoms as the heads of the composites, the umbels, etc. The bract of the common lime-tree is such an excellent example of bract formation (Fig. 61), that though the lime is scarcely a “wayside weed,” we make no excuse for bringing it forward. If you really do not as yet

know a lime-tree, you can scarce miss it henceforth when you know that you cannot go within many yards of it in July without being attracted by the scent of the blossoms, or by the hum of the myriads of bees which swarm around it. Go, pray, for the sake of the bract, pluck a twig of the first lime you meet with, only remember it belongs to Handful No. I., for it is a many-petaled bloomer.

## Handful IV.

*Handful IV. a Handful of Favourites—They are One-petaled—Distinction from Handful III.—Our Botanical Position in Handful IV.—Free and Attached Stamens—Primroses and Forget-me-nots—Pimpernel and Loosestrife—The Primula tribe—The Speedwell and Figworts—The Labiates or Lipped Flowers—Convolvulus and Plantain—Leaves—Their Infinite Variety—Parts of the Leaf—Ribs and Veins—Netted Veins and Straight Veins—Compound Leaves and Simple Leaves—Leaf Surfaces, etc.—Cutting of Leaves—Stemless or Sessile Leaves—Seed-leaves—Leaf-buds.*



## HANDFUL IV.

“By the primrose stars in the shadowy grass.”

WHEN we come to look into Handful IV., we find we have got in the midst of a whole host of well-known favourites—regular play-fellows, almost, which seem to have grown up with us from childhood, though many a fair generation of blossoms—we almost fear to think how many—has come and gone since some of us first gathered primroses or cowslips in May, forget-me-nots in full summer’s flushing, heather from the purple hills of August, or holly to deck the rooms in those days when mince pies and plum-pudding had their special relish and their special impunity, or before we cared to know to what division, family, or genus the botanist assigned our favourites; but now, that is just what we want to know, so let us see, in the first place, what we have got. Heath-flowers and heather; the holly, though many of our reader, probably, know the leaves and berries better than they do the blossoms; convolvulus, or bindweed, or lap-love, for it has all those names (Fig. 71); forget-me-not

(Fig. 68), sufficiently well-known to every youth who has consigned his heart to the keeping of some fair maid, and, for that matter, sufficiently well known to the fair maids themselves. Next have we the veronica, speedwell, or Venus's looking-glass, of real heavenly blue. The mint family, with the red and white dead-nettles, the wild thyme, and the self-heal (Fig. 62) come next; then our friends the primrose and the cowslip, and, with them, the scarlet pimpernel, or poor man's weather-glass, which closes its brilliant petals long before the coming storm. Lastly, we have plantain for the bird-fancier, and the pink-headed thrift of seaside wastes, but perhaps more familiar as a bordering to old-fashioned flower-beds. We have a rare Handful this time, almost the best of our series, and were we not afraid of increasing its dimensions beyond our grasp, we might have graced it with more well-known blossoms still, such as the conspicuously handsome foxglove race; but we have enough and to spare for our lesson.

It does not need much dissection of our blossoms to tell us that we have all monopetalous corollas, and indeed that bright blue veronica (Fig. 63) does not wait for our dissecting, but insists on casting off its corollas all in a piece, with the two stamens adhering. They are thoroughly *deciduous* corollas. The rest of our flowers are not quite so precipitate in their proceedings, but there is scarce one we have



FIG. 62.—Common Self-heal. Blossoms arranged spike-like, in whorls, within coloured bracts. The irregular, lipped blossoms, the irregular calyx, the square stem, and the opposite leaves, are all characteristics of the Labiate leaves.



named which will not at once disclose its monopetalous character to the most cursory examination. One-petaled, therefore, are our present flowers, like those of our last Handful, but the attachment of

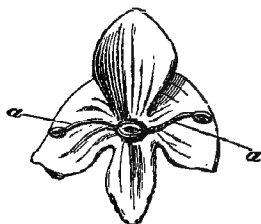


FIG. 63.—One-pieced deciduous corolla of common Speedwell,  
a a, the stamens attached to the corolla.

the corolla is like that of our first-examined blossom of the many-petaled families—namely, to the receptacle beneath the ovary, and not to the calyx. Our present plants, therefore, belong to the one-petaled “*Corollifloræ*” section, in contradistinction to the one-petaled *Calycifloræ*. Now, before going further, let us get a clear idea where we are in the botanical world. We made our entrance into it, as you may remember, by examining plants\* which had blossoms in many distinct pieces, whereof the buttercups and their relations were prominent examples, the blossoms having both petals and stamens fixed to the receptacle just beneath the seed vessel or vessels. Our next move was to plants which, still with many petals, had both petals and stamens

\* See Handful No. 1.

attached, not to the receptacle, but to the calyx,\* the rose tribe being the first examples. Another advance brought us to plants which, instead of having many-pieced corollas, had them all in one piece,† but still with the same attachment as the last named many-petaled, to the calyx; and now in our fourth step we find ourselves returning to the receptacle attachment as at first, only with monopetalous corollas. To make the above more clear, we subjoin the following table, which is a slight simplification of that prefixed to that best of British Floras, Hooker and Arnott's:—

Corolla in Many Pieces	{	Corolla and stamens inserted on receptacle, represented by buttercups and poppies.
		Corolla and stamens inserted upon calyx, represented by roses and pea tribes.
Corolla in One Piece	{	Corolla and stamens inserted upon calyx, represented by campanulas and composites.
		Corolla and stamens inserted on receptacle, represented by primrose and mint tribes.

A glance will now tell our traveller in Flora's realms the ground he has already gone over, and, as we find ourselves in the fourth or last division, we again return to our primroses and their congeners. We should tell you, however, that in this last division there is yet a sub-division into plants

\* See Handful No. 2.

† See Handful No. 3.

which, like the heaths and the plantain (Fig. 64), have their stamens free from the corolla, and into those, constituting by far the largest portion of this monopetalous division, which have their stamens attached to the corolla, and, consequently, through it to the receptacle. Take one of these little heath-bells (Fig. 54), open it up, and you will see the stamens are all connected directly with the recep-

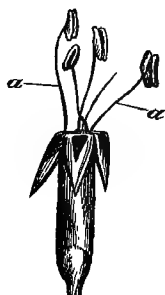


FIG. 64.—Floret of common Plantain. *a a*, elongated filaments of stamens.

tacle. Now take your primrose flower (Fig. 65), and you will find the five stamens all inside the tube (Fig. 66), and so closely attached to it, that there is scarcely anything you can call a filament. The heath flower is a good example of what botanists call the inflated corolla, as the primrose (Fig. 65) is of the salver-shaped, the flat expanded portion constituting the limb, which merges into the *tube* at the *throat* (Fig. 67). Compare the forget-me-not in your hand with these; it is somewhat like the

primrose, but more *wheel-shaped*; the tube you will find is much shorter than that of the primrose or

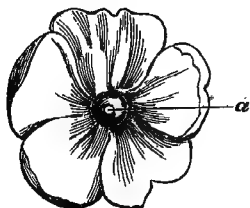


FIG. 65.—Salver-shaped blossom of common Primrose. *a*, globular stigma showing at mouth of cylindrical tube.

cowslip, and yet it includes the stamens, which are attached to it. Moreover, the little tube is partly

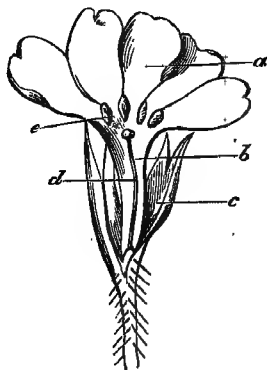


FIG. 66.—Flower of common Primrose laid open. *a*, limb of corolla; *b*, tube of corolla; *c*, calyx; *d*, pistil; *e*, stamens.

closed over with *scales* or valves. There are many species of the forget-me-not—mouse-ear it is sometimes called—but we are now presuming that you

have got the largest and handsomest—the water-plant (Fig. 68), the true forget-me-not which the drowning troubadour cast ashore to the feet of his lady-love. The forget-me-not, or *Myosotis* genus, as botanists call it, belongs to the *Borage* tribe, the

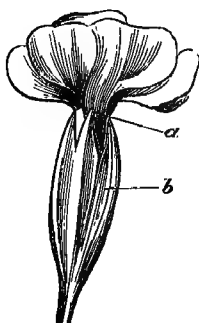


FIG. 67.—Blossom of common Primrose. *a*, tube of corolla ;  
*b*, tubular campanulate calyx.

members of which are remarkable for being more or less clothed with stiff, rigid hairs. The primrose, from which we digressed to compare corollas with our little *Myosotis* friend, gives its own name to the tribe, the *Primulaceæ*, to which it belongs. More noted for the beauty than for the useful properties of its members, the tribe offers us most excellent examples of blossoms, regular in form. First take a glance at the leaves of the primrose, as we shall refer to them shortly, and now take up the scarlet pimpernel (Fig. 53), and, if you know it,

the yellow wood loosestrife (Fig. 69). Both these plants are classed under the primulas. You, perhaps, do not think them *very* like, but just take the general description of the primrose family, as you



FIG. 68.—Common Water Forget-me-not. The corollas rotate, or wheel-shaped.

find it in the Flora, remembering the general division into which we have already got our flowers; namely, one-pieced corollas, attached to the receptacle. The description says, "Stamens inserted

upon the corolla, distinct"—that is, not connected one with another—"corolla coloured. Style terminal"—that is, springing from the top of the ovary—"ovary entire, one-celled; corolla regular;

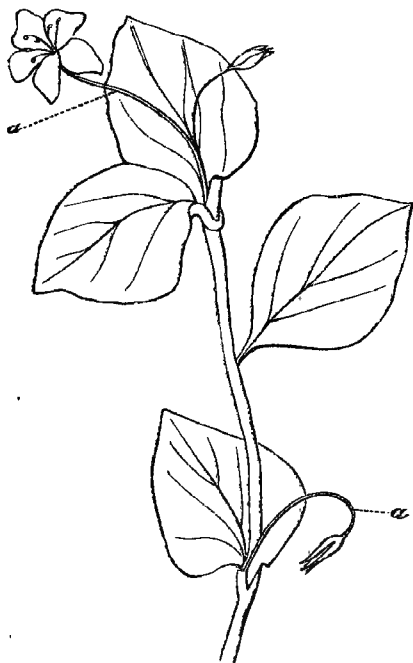


FIG. 69.—Spray of common Yellow Loosestrife. *a a*, blossoms springing from the axils of the flower-leaves or bracts.

stamens opposite the lobes of the corolla, and as many, equal. Style 1." Such is a description which, taken along with the general classification,

is sufficient to distinguish the primula family from any other family of British plants.

Consider it well, for it is a good lesson; the family is exceedingly distinct, and the characters given can be easily made out, even by a beginner. How the members of the primula family—the pimpernels, the loosestrifes, and the primroses themselves—are distinguished from each other, we must leave to our lesson on classification.

Our blue veronica, or speedwell (Fig. 63), itself a pretty little plant, has many relatives with more strongly-marked properties—among them the fox-glove; moreover, most of its tribe have irregular corollas. You may at first have thought the veronica a regular flower, but a moment's inspection will show you it is not, and that the divisions of the corolla are far from being equal. Indeed, the irregular blossoms of the figwort tribe, which includes our veronica, closely resemble those of our next tribe, the labiate plants, to which the dead-nettles, the mint, and the thyme, all of which you have in your Handful, belong.

The figworts and the labiates have, as you see, both of them irregular, two-lipped flowers; in other respects they are very different. Take one of your dead-nettles (Fig. 58), and examine it. First, there is a square stem; then there are opposite leaves, which hold clusters or verticilli of blossoms in their axils; the calyx has an upper and lower





buckbean.



Perfoliate Yellow-wort.



Lungwort



Tufted Centaury.

lip, and of the four stamens contained within the upper hood-like lobe of the corolla (Fig 70), two are long and two short. Lastly, pull out this corolla, which comes away, stamens and all, and you will see, at the bottom of the tube-like calyx, what look like four little square seeds, but which are really four little seed-vessels, each with its own single seed within. Go over again these characters of the labiates, and you cannot but see what



FIG. 70.—Floret of a Labiate plant. *a*, Stamens contained within upper or hood-like division of the corolla; *b*, lower lip of corolla; *c*, calyx, which is slightly irregular.

strong family features they carry with them. Many, like the mints, thyme, marjoram, and lavender, are characterized by the abundance of their fragrant essential oils.

There yet remains for you to examine the holly, the convolvulus (Fig. 71), the sea-thrift, and the plantain. The convolvulus requires no lens to bring out its peculiarities, amid which the plaiting of the unexpanded corolla is conspicuous. As

you advance in botanical knowledge, you will find the convolvulus tribe noted for many medicinal members, with which, possibly, you have made acquaintance under less agreeable circumstances ; it is sufficient to name ipecacuanha and jalap as products of the Convolvulacæ, to give you an interest in them replete with painful reminiscences, which may, however, aid in fixing your lesson in your mind.

We need not detain you with the thrift, further than to bid you examine it for characters similar to the rest of your Handful. Our spiked plantain is not so flower-like as the rest of its companions, that is to say, its blossoms want the size of some, and the bright colours of others of its associates ; but each little floret of the spike is a perfect little flower, symmetrical and complete in every way, only it has a strange mode with its stamens, which have filaments so long that they require double folding (Fig. 64) in the unopened bud.

Once more review your Handful, for it is an interesting and instructive one, seeking in each separate plant the general characters which bind its apparently diverse elements together.

The botanical lesson with which we terminated our third Handful of Wayside Weeds, left us looking at the bract of the lime-tree (Fig. 61), and a very distinct and well-marked specimen of a bract



Fig. 71.—Common Bindweed or Convolvulus. The corollas regular, in one piece or plaited; the leaves "hastate," or spear-shaped.



it is; but you remember, probably, that many bracts were not by any means so readily distinguishable from the leaves; indeed, that in numerous cases they were, to all appearance, leaves and nothing else, but for the fact of being supplementary to the peduncles or pedicels of the blossoms, as we see in Figs. 53, 69, and 71, where the flower-leaves or bracts are indistinguishable from ordinary leaves. The transition then is natural from a lesson on bracts to a lesson on leaves.

A first look around you upon the varied foliage of a summer landscape in England, or even a cursory glance over that of the first meadow or hedge-row you come to, will give some notion of the infinite variety of leaf forms; and it may seem a formidable task in prospect to acquire a knowledge of them, but the interest will repay the labour, and the latter is not really great when the general rules are mastered which botanists employ to reduce the apparently heterogeneous collection to order and classification. We do not seem to have moved from the vicinity of the lime-trees, so pluck one of its bright green shining leaves; or failing the lime-tree, gather a nettle-leaf (Fig: 72), which will do as well; or, if you fear the sting, look for the red dead-nettle, which will not sting, or for a violet-leaf, or indeed for the first broad-looking leaf you can find. Lest, however, you should not be in the way of any other leaves than those of the present number of

“Recreative Science,”\* we furnish you with a specimen (Fig. 72), from which we must learn our lesson. One thing is very evident, that the broad expanded portion or *limb* or blade of the leaf is composed of two structures, the ribs or veins, and the green pulp lying between. In most leaves one

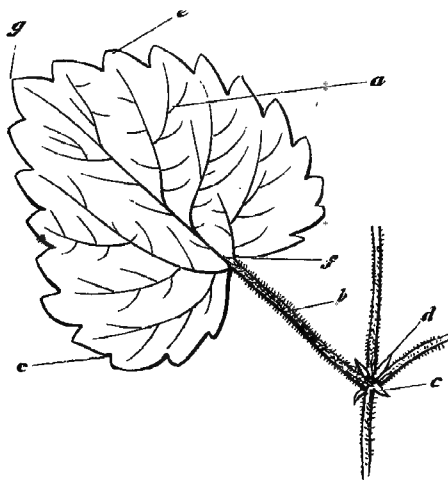


FIG. 72.—Leaf of common Nettle. *a*, Limb or blade; *b*, petiole; *c*, stipules; *d*, axil; *e e*, margin; *f*, base; *g*, apex.

main or mid rib runs up the centre of the leaf, and from this the veinings of the leaf branch out, interlacing with one another. In some leaves, however, there are more than one rib to the leaf, as you may see in the common plantain (Fig. 52), if you either

\* The periodical in which these papers were originally published.

examine the plant itself, or turn to the illustration. Again, as partly exemplified in the lime leaf, and also in the nettle, other ribs or veins frequently start from the base of the leaf as well as the midrib. This leaf ribbing or veining has much to do with determining the form of the leaf, and you cannot do better than compare its variations in any broad leaves you may gather.

But now take the long thin leaf of grass (Fig. 56), of sedge, or of water iris; or, if you prefer garden flowers, take hyacinth, tulip, or lily of the valley; you will find no branchings in these leaves, nothing but straight lines or veins running all the length of the leaf. You see at once we have our leaves divided into two distinct classes—netted-veined leaves and straight-veined leaves. The former greatly preponderate in our northern regions, the latter occurring only in the form of grasses or small flowering plants; but in the southern and tropical climates this is reversed, and then the straight-veined leaf is found on the loftiest trees, on the palm, the banana, the arborescent if still grassy bamboo, whilst it characterizes also the beautiful or quaint orchid. You will find, when we come to our lesson on classification, that these two kinds of leaves mark with great exactness the two great divisions of the flowering and seeding members of the vegetable kingdom.

Let us go back to the leaves with netted veins.

We have, it is true, severed them from a mass of straight-veined neighbours ; but, even now, when we come to look into them, their number and form seem endless. We do not look long, however, before we find another line of distinction among themselves. You know the leaf of the wild rose (Fig.

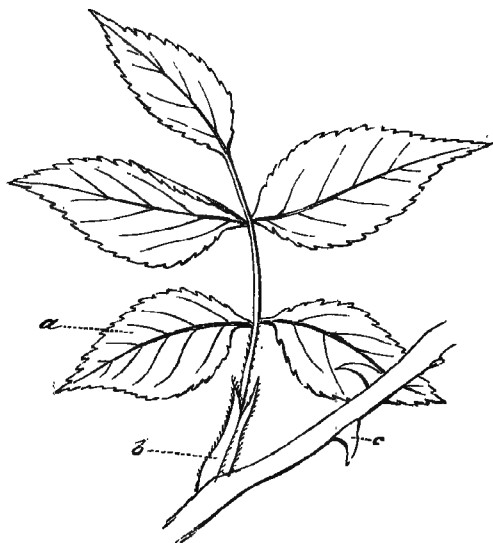


FIG. 73.—Compound Pinnate Leaf of Rose. The segments of the leaf, *a*, ovate, with an acute apex and serrated margin ; *b*, stipules ; *c*, seta or prickle.

73), of the bramble (Fig. 29), of the clover (Fig. 74), of some of our old friends of the umbel-bearing class (Fig. 36), and perhaps of the ash-tree, and lastly of the vetch (Fig. 34). Put any or all of these beside the leaf of the oak (Fig. 75), of the

bryony (Fig. 76), of the lime; or, to go to more familiar plants, of daisy, or dandelion, or wild geranium (Fig. 77). The difference is evident between the compound or many-pieced leaves of the first set, and the simple one-pieced leaves of the second. We

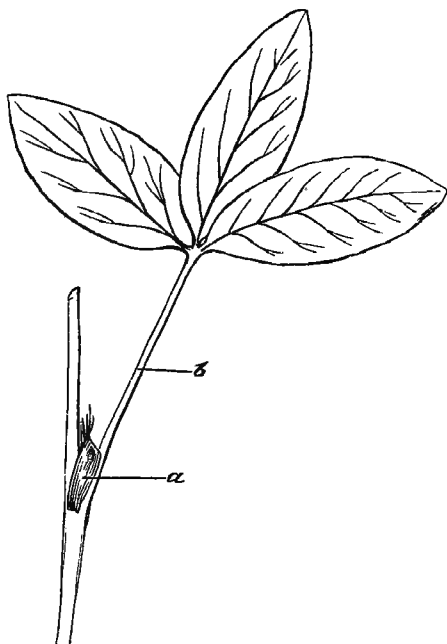


FIG. 74.—Compound Palmate Leaf of Clover. *a*, stipules; *b*, petiole.

begin with the latter, but do not confine yourselves to the examples we have given you, but collect in as great variety as you can. When you have done so, we doubt not that you will find the majority of the

leaves you gather are made up of two parts, the broad blade or limb, or leaf part proper (Fig. 72, *a*), and the supporting stem, or petiole (*b*). In a cer-

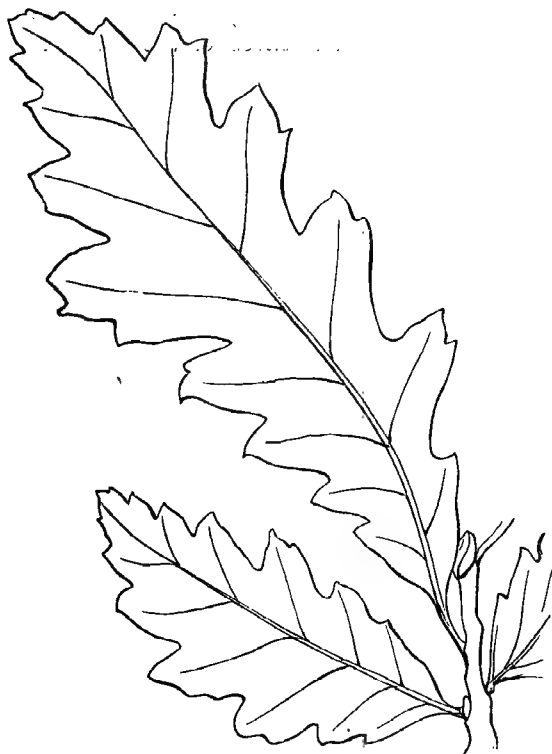


FIG. 75.—Leaf of Oak. Form oblong ovate; the margin sinuate.

tain number you will find a third part—or parts, for there are two (Fig. 72, *c*)—at the base of the petiole, called the stipules. In our example, the

nettle leaf, the stipules are small, but at the base of the petiole of the compound rose leaf (Fig. 73), or in many vetches, and in the clover (Fig. 74), you will find the stipules much more fully developed. The point of junction of the leaf-petiole with the stem of the plant from which it springs (Fig. 72, *d*), is called the axil or axilla, and from the angle, formed by the two, frequently spring leaves, flowers, or buds (Fig. 69, etc.) As the ribs and veins of a leaf give it form, and govern, likewise, its irregularities, the intervening green pulp, or, as botanists call it, parenchyma, makes up its substance, both being covered over with the skin, or epidermis, of the plant. Much is there to tell of the beautiful and important functions performed by leaves, through their veins, parenchyma, and epidermis; but we have too much to say of their outside forms to enter into these things now.

It seems superfluous to remind the reader that a leaf has two surfaces, but we do so to direct the attention to the difference in these surfaces in every leaf you examine, that difference being, of course, much greater in some than in others. The chief appendages attached to leaves are hairs of very varied form, from the softest down, or the satiny lustre of the mountain lady's-mantle, to the sting of nettle, which is a glandular hair, or the prickle, or seta, of the rose-leaf, or rose or bramble stem (Fig. 73); the seta being in reality hardened hair.

Remember, here, that holly prickles, with all their Christmas associations, are not hairs, but the hardened extremities of our old friends the veins.

Remark, again, that a leaf has margin, base, and apex (Figs. 72, 76, *e*, *f*, and *g*), and you have



FIG. 76.—Leaf of common Black Bryony. *a*, blade, or limb; *b*, petiole; *c*, stipule; *d*, axil; *e*, margin, entire; *f*, base, cordate, or heart-shaped; *g*, apex, acute.

got the general outline of the leaf. But from the margin we get a whole lot of distinctive marks; for it may be entire, as in Fig. 76; serrated, or saw-toothed, as in the rose leaflet (Fig. 73), or in

the lime (Fig. 61, etc., etc.), more deeply cut or toothed, as in the nettle (Fig. 72); or sinuate, that is, cut in a wavy fashion, as in the oak (Fig. 75); lobed, as in the leaf of the common little soft-leaved geranium (Fig. 77); or deeply cut, forming

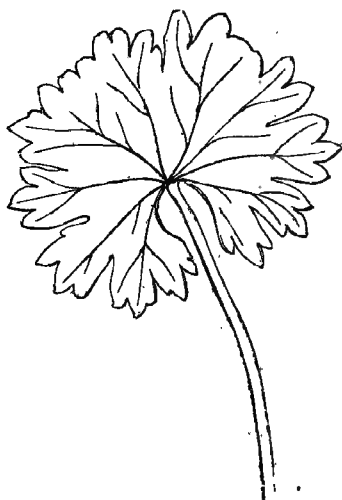


FIG. 77.—Rounded, or kidney-shaped Leaf of common Dove's-foot Cranebill, cut in rounded lobes.

the pinnatifid leaf, as in the common poppy (Fig. 78). The apex of the leaf takes many forms; for, though pointed in the majority of leaves, the form of the pointing varies much, and at times there is no point at all, the leaves being either blunted in some way, or rounded as in Fig. 77, or as in the well-known Indian cress; or kidney-shaped, as in

the marsh violet. The base of the leaf, likewise, has many forms; and thus, according to margin, including both base and apex, we get the diversified shapes of foliage, which not only vary so much in different species, but are even so modified in the leaves of the same tree,

“That two were never found  
Twins at all points.”

Thus the leaf of the black bryony (Fig. 76) is aptly described as heart-shaped from its base, acute from its apex, and with an entire margin;\* that of the lime (Fig. 61) as less distinctly heart-shaped, but with serrated margin. The leaf of the plantain (Fig. 52) is a broad ovate; and each individual leaf of the woodruff (Fig. 45) is lanceolate, or lancet-shaped, but approaching the linear, or line-shaped, leaf which we see in the harebell (Fig. 47), or in the grass (Fig. 56).

Each leaflet of the rose (Fig. 73) is ovate, acute, and serrated; of the vetch (Fig. 34) ovate and entire. In the leaf of the poppy (Fig. 78) we find the cutting so deep that it almost approaches the compound leaf, and the same occurs in the leaf of the ragwort (Fig. 44), in which also we see the example of the lyrate leaf, which is, however, still

\* The black bryony, a very common wayside weed in England, found twining among the hedges, is an exception to the rule of netted and straight-veined leaves. It belongs, in everything but its leaves, to the straight-veined section of the vegetable world.

better exemplified in the leaf of the common turnip ; and this cutting up into segments, without the leaf being compound, appears strongly in the wild chamomile (Fig. 43). Then we have shield-shaped, and arrow-shaped, and spear-shaped leaves (as in



FIG. 78.—Leaf of Corn Poppy, deeply cut, pinnatifid, not compound.

Fig. 71), lobed leaves of all varieties, and many others which it would not come within the scope of these papers to enumerate and illustrate, and which will best be studied from the cullings of the way-

sides, referring the leaves of each plant to the description given in the Floras.\*

The rose, the vetch, the ash-tree, have truly compound leaves, that is, are composed of a number of leaflets arranged upon a central petiole, and jointed more or less distinctly to it, forming what is called a pinnate leaf, in distinction from the radiating or palmate compound leaf of the clover (Fig. 74), of the strawberry, etc., etc. The umbel-bearers, among others, offer us a large variety of compound leaves.

You will call to mind that, in describing a perfect leaf, the petiole, or footstalk, was given as one of the parts; but long before this we expect you have discovered that there are many leaves which have no petiole at all, but are directly attached to the main stem. These are called sessile, or sitting leaves. When the attachment is a simple one, when the leaf is not only closely attached to the stem, but is prolonged down it, as you will find in the thistle, it gets the name of decurrent, or running down leaf; or when it more completely envelopes the stem, it becomes sheathing, as in the grass (Fig. 56). In the common teasle, the pairs of opposite leaves join, or grow completely round the stem, and then are called connate; whilst a perfoliate leaf is one which the stem seems, as it

\* A "Flora" is a book giving the description and classification of the plants of any particular district or country.

were, to perforate. Lastly, some leaves appear to have no stem whatever to be attached to, as in our friend the plantain, and then get the name of radical, or root leaves. Whorled leaves are those which are arranged round the stem, as in the wood-ruff (Fig. 45). As yet the leaves we have been dealing with have all been true leaves, but many plants show, in the first stage of their growth, a

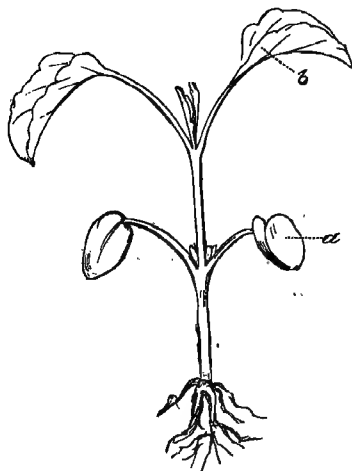


FIG. 79.—Seedling Plant. *a*, cotyledonary, or seed-leaves; *b*, true leaves.

leaflet, or pair of leaflets, which are totally distinct in form and appearance from all that succeed them. These first leaves are the cotyledonary, or seed-leaves of the plant. If you have ever planted a lupin-seed, and watched its growth, or carried your horticulture so far as to sow some mustard-seed,

you will know what is meant ; but if not, you may soon do so, either by trying the above, or using your eyes in your next spring walk, when you will find, under every hedge, crowds of little seedlings throwing up their first seed, or nursing leaves, and pushing out from between them their true leaves, as you see in Fig. 79.

One more point connected with leaves, and we have done, fearing almost that you are already tired of us. You have not forgot that in our talk about blossoms, it was mentioned that botanists took distinctive plant-characters from the folding of the flower in the bud, before opening—from the *æstivation*, as it is called. In the same way are characters taken from the leaf before expansion—in this case named *vernation*. It is sufficient here to mention the fact.

## Handful V.

*Little of outside beauty in Handful V.—Docks and Knot-grass—The Spurges—Starwort—Forest Trees—Characters of Handful—The Blossoms incomplete—Knot-grass or Bistort characters—Spurge characters—Starwort characters—Wall Pellitory—Trees of the Greenwood—Simple characters of their blossoms—Willow; Hazel; Birch; etc.—The Pine tribes—Stem or Root—Aerial Roots—Herbaceous or green, or Woody Stems—Compound Stems—Simple Stems—Grass and Palm Stems—Direction of Stems—Twining or Climbing Stems—Shape of Stems—Winged Stems—Underground Stems—Stems Apparently Absent—Roots—Fibrous or Branched—Fleshy Roots—Tuberous Roots—Office of Roots.*



## HANDFUL V.

“Wondrous truths, and manifold as wondrous,  
God hath written in those stars above ;  
But not less in the bright flowrets under us  
Stands the revelation of his love.”

LONGFELLOW.

It is but little in the way of bright colour or sweet scent we have to offer you in this our Fifth Handful, and therein lies a difficulty, as far as the plan of our lessons on “Wayside Weeds” is concerned; for whilst the gayer or more conspicuous weeds and wild flowers we have hitherto discoursed upon are known to all, the less attractive and scentless plants are but little recognized by the inattentive passer-by. However, let us try, and do not turn away because we bid you gather unattractive weeds; they have only to be looked into and examined, to exhibit that beauty and that perfection which is never wanting, even in what may seem to man the lowest of the Creator’s handiworks.

Begin with picking one of the common dock tribe, the usual, and certainly not handsome, representatives of vegetation which are found most com-

monly about building rubbish and on neglected ground ; add to it one of the nettles which usually keep it company, and put alongside the nettle, if you can, its relative the common hop (Fig. 57), establishing what seems to you a strange relationship. Keeping still to our rubbish-heap, or searching any roadside, where weeding is neglected, you gather an insignificant-looking little plant, truly a wayside weed, with stems so weak that they rest

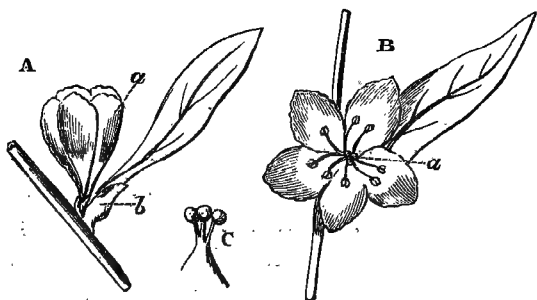


FIG. 80.—Blossoms magnified of common Knot-grass. A, Side view ; a, perianth ; b, membranous bracts. B, Front view ; a, triple styles. C, Style much magnified.

much on the ground, and with numerous little pink blossoms (Fig. 80) fitting closely into the axils of the leaves. This, the common knot-grass, has a close family connection with the buckwheats. These knot-grass, bistort, and buckwheat weeds are near relatives of the docks, as you will find out on examination ; moreover, their little pink flowers are very pretty indeed when minutely looked into, and even

without the magnifier give some amount of lively colour to our otherwise sombre handful, especially if we gather some of the larger flowered bistort\* species. For our next plant you probably need not

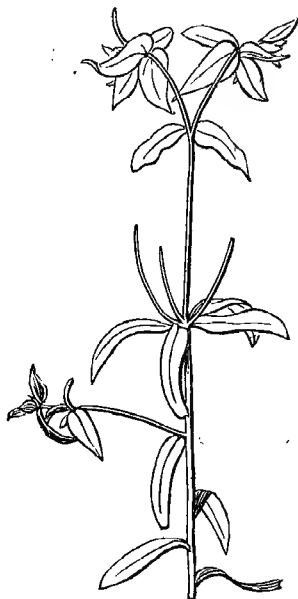


FIG. 81.—Petty Spurge. The blossoms arranged in umbels.

go further than the first neglected garden, where “weeds do grow,” for there, or on some neglected bank outside the garden, the spurge or euphorbia family are most apt to take up their quarters.

\* The knot-grass, bistort, and buckwheat, all belong to the same botanical genus, *Polygonum*.

Every school-boy, who has applied their milky juice as a cure for his warts, knows the spurge (Fig. 81); they are curious in their flowering, and puzzling enough to an incipient botanist. But more of them presently. And now go to the runlet, or to any ditch of clear water, for a handful of those very bright green, floating, star-like leaves, which characterize the water starwort; you see no flowers, but never mind that, we shall find those for you presently.

It seems quite a jump from this little water-plant to the forest-trees, to the oak, the birch, the hazel, and the willow, such a jump that all connection appears wanting between these and the lowly weeds we have just been directing you to; nevertheless we shall see, although, confessedly, we have brought together an apparently heterogeneous handful, and one not quite so attractive to a beginner as those we have already passed. The trees you must know well enough, even if you never thought of their having blossoms, but you must look for their flowering in spring and early summer.

But it is time we looked for that character in common which connects together plants so apparently diverse. We have, you are aware, hitherto found the flowers we examined, whether many-petaled, or one-pieced blossoms, perfect; that is to say, possessing both calyx and corolla, the plants now in your hand are all distinguished by having incomplete flowers; the calyx and corolla seem



Bog Pimpernel.



Common Eyebright.



Red Bartsia.



Smooth Sea-heath.



merged into one, forming what is called the perianth, as in the knot-grass (Fig. 80), and in many of the division there is not even an attempt to develop what we usually consider a flower, but as in the hazel, the birch (Fig. 86), the willow, or the little starwort (Fig. 82), a simple scale is all that is left to represent the gay corollas and green flower-cups of our well-known blossoms. By some this division of

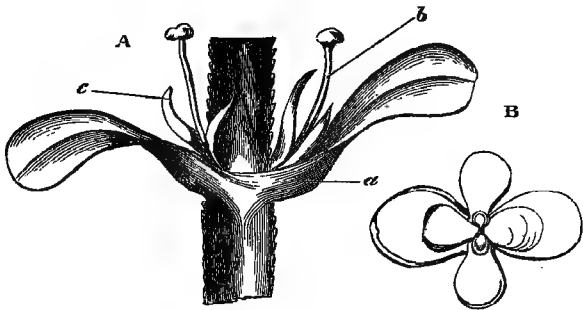


FIG. 82.—Magnified view of Barren or Stameniferous Blossoms of common Starwort. A: *a*, leaf, partly embracing the stem; *b*, stamen with one-celled anther; *c*, scale which represents the perianth. B, Star-like arrangement of leaves.

flowering plants is called the Apetalous, or petal-wanting, in contradistinction to the Monopetalous and Polypetalous; by others the families are classed as the Monochlamydeæ, or those with but one floral covering. It is not, however, simplicity alone which we meet with in some of these flowers under notice, but, as in the spurges (Fig. 83), extreme peculiarity of structure.

Now as the compass of our paper will not allow of a minute explanation of the structure of all the certainly dissimilar plants to which it has introduced you, let us take three, at first, as unlike as possible, the knot-grass and buckwheat (Fig. 80), as most resembling our ordinary notions of a flower; the spurge (Figs. 81, 83) as a specimen of the curious, and the starwort (Fig. 82) of the simple; for all three you will need your magnifier.

The knot-grasses or buckwheats you will find have a perianth of five coloured segments (Fig. 80), doing duty for both calyx and corolla, though most resembling the latter; a definite number of stamens, and a central ovary, at least in the common species we have pointed out to you, crowned with three little knobs or styles; and if you examine further some of the blossoms which are more advanced, you will see that the ovary thus tipped has developed into a three-cornered little fruit, or, as a botanist would call it, achene. You remember we told you that the docks of the rubbish-heap were family connections of the buckwheats; examine both flower and fruit of the former, and you will find, with certain differences of course, how many points they have in common.

We turn to our friend with the milky juice, the dwarf spurge (Figs. 81, 83); not one of the umbel-bearers properly so called, although its blossoms are arranged in umbels; these same blossoms

being very odd concerns. The illustration (Fig. 83) represents a single set of flowers of the dwarf spurge in two positions, and magnified of course. You observe a set of flowers, not a single flower, for that which seems to occupy the position of perianth is ranked as the involucre, containing several barren or stamen flowers (Fig. 83), and one fertile or pistil flower, which has its germen

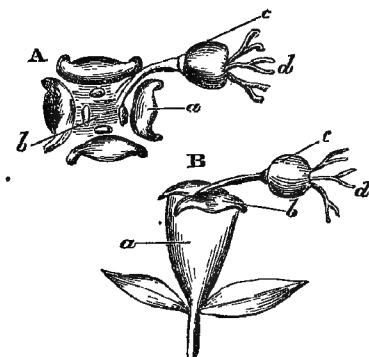


FIG. 83—Magnified Blossoms of Petty Spurge. A, front view: *a*, glands of involucre; *b*, stamens; *c*, ovary; *d*, pistils. B, side view: *a*, involucre; *b*, glands; *c*, ovary; *d*, pistils.

crowned with three forked or bifid styles, and is conspicuously extruded. In addition, however, to the stamens and pistils, the involucre contains a set of remarkable “horned glands;” the real perianth, which might be expected to lie within the involucre, is scarcely, if at all, present, in the form of a minute scale.

The starwort, third in our group (Fig. 82), is

the essence of simplicity ; so much so, indeed, that you will find it almost as difficult to realize its flower, as you may have done in the singularity of the spurge blossom. If you examine with your magnifier the axils of the starwort leaves, which partly embrace the stem, you will soon discover, but not together, either the single stamen or the little ovary, with the two wee white bracts at the base, which is all this little bright plant has to boast of in the way of floral appendage ; little enough, but yet the flower is a real flower, having its essential organs of reproduction, if not the organs calyx and corolla, which, as we have already explained in a former lesson, constitute a perfect flower.

We might say much more of these insignificant flowers which go to make up our Handful : of the nettle, which, common and despised as it is, has flowers which repay examination, and of the wall pellitory, too, a first cousin of the nettle, which finds root at the base of old dry walls : the situation, the general reddish tinge about it, its inconspicuous flowers, and its loosely hung leaves, will tell you the plant, and it is worth a few minutes' examination with the lens to make out the beautiful structure of the jointed filaments of its stamens (Fig. 84).

But we have kept these tall trees of the greenwood, mentioned before time, waiting so long,

that we must not stay longer amid the weed class—real true weeds they are, most of them, but with a curious minute beauty of their own which well repays examination; having shown you the way, we leave you to work out your further acquaintance with the docks, the nettles, the goosefoots, and their congeners. And now for our trees. We give you our list, and you must pick out as many as you know, or as many as you can find. The birch, oak, alder, poplar, the numerous willows, the hazel, the elm, the beech, and the fir, and various others, all fall into our category, and are connected



FIG. 84.—Jointed elastic stamen of Wall Pellitory.

both with one another, and with the weeds of our Handful already noticed, for, being dicotyledonous plants, they are at the same time destitute of the double and complete floral envelopes, such as we have hitherto been accustomed to. Some of our trees, such as the elm, have their flowers so far regular that they have both stamens and pistils in the same blossom, but in most the stamens and pistils are separated, either on the same or on different plants, and in many the flowers, such as they are, cluster together in what is called an amentum, or catkin,

that is, a succession of little blossoms surrounding a stem, pendant or otherwise, each little blossom being composed of a scale with two or more stamens attached. Such little scale-formed blossoms we have in the case of the common willow, and the birch has a very similar arrangement. In the hazel, the catkin of male flowers, the "pussy-cat's tails" of our early days, are very conspicuous; but not so the pistil-bearing flowers, which indeed few know but those who have had a botanical introduc-

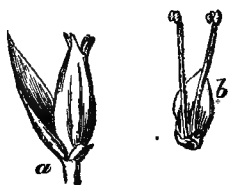


FIG. 85.—Single Blossoms of Willow : *a*, pistil-bearing, or fertile blossom, with scale; *b*, stamen-bearing, or barren blossom, with scale.

tion to them, for the large stameniferous catkin, shaking out its showers of golden yellow pollen in early spring, quite eclipses the little bud-like fertile blossoms, which you will find not far from their more conspicuous mates, albeit you would scarcely distinguish them from buds, but for the protrusion, from their extremities, of a number of brilliant red filaments; these are the styles, and within the little bud lies the ovaries, which, in due time, become the clusters of autumn; the ovary expanding into the nut, and the scales of the bud into

what people call the husk, but a botanist the involucre. The oak, too, has its barren and *deciduous*, or quickly-falling stameniferous catkins, but its fertile flowers are solitary within a cup-shaped scale, or rather aggregation of scales, which at length become the "acorn cups" of fairy lore.

Lastly, we have mentioned the fir. It, too, has its barren catkins, but the fruit, as all know, is in the fir cone, which generally we see when it has dropped seedless and dry from the tree; the ovules, the seeds, which lay naked at the base of the scales in the dry cone, having disappeared, wings and all. The naked seeds of the firs or pines, that is, seeds without proper pistils, and their many cotyledonary, or seed-leaves, in contradistinction to the two seed-leaves of the plants hitherto examined, place this pine tribe by themselves, even were there not other distinctive characters in leaf, wood, etc.; but these are not for our beginners to enter into.

With the simple incomplete flowers of our woodland trees, we come to an end of the first great division of the vegetable kingdom, that which includes plants with two seed-lobes, or seed-leaves, or cotyledons, hence named the dicotyledons, and which, having netted veined leaves, also grow by the deposit of annual rings of wood on the outer circle of their stems, beneath the bark, and hence are frequently called exogens, or exogenous plants. . After our next lesson on stems and roots, we reach the

second great division of plants, the Monocotyledons or Endogens, and get again amidst gay colours and handsome flowers.

From the leaves and flowers which have hitherto formed the subjects of our botanical lessons, we naturally look to the stems by which both are sup-

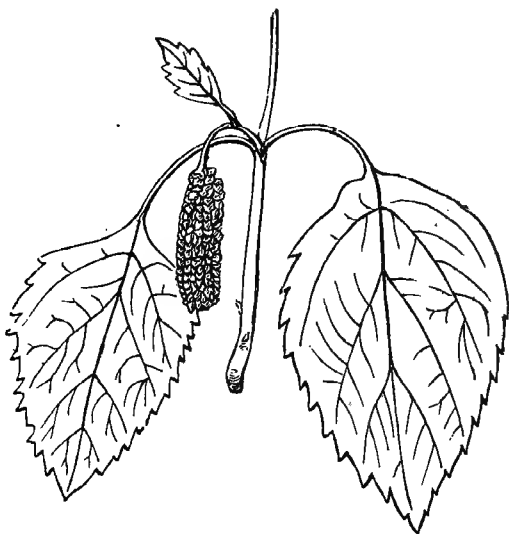


FIG. 86.—Catkin Blossom of common Birch.

ported. By stems we do not mean the peduncles and petioles. For we trust our readers have not forgotten that these are not the main stem or axis which forms the plant centre, and from which flower-carrying peduncle and leaf-supporting petiole alike spring. With the stem, we by consequence

connect the root, and treat of both together. Were we to ask our novitiate readers what parts they would consider most necessary for the existence and individuality of a plant, they would be much inclined to name root and stem, and yet there are plants apparently destitute of one or other of these parts. Some of the orchis tribe have no roots at all, except such as are air planted, or aërial, and the familiar primrose, the plantain (Fig. 52), the stemless thistle, etc., etc., seem equally destitute of stem: seem, be it remarked, for no plant which bears a leaf can be said to want a stem of some sort, be it ever so short, no more, perhaps, than what is called the root crown, but still it is stem, for though so intimately connected, the two parts root and stem claim to be essentially distinct from the first moment of their seedling birth, when the root *will* go down, and the stem *will* go up as by most unerring instinct. If any reader could tell us why all roots tend to strike downwards, away from the light, and towards the centre of this terrestrial ball of ours, they would answer a very puzzling question. Many experiments have been tried, and germinating seeds have been placed in all positions and circumstances, but yet down go the roots, up go the little seedling stem, and all we can say is that so it has been ordered by God.

Of stems we have many varieties; you have only to use your eyes in the first walk you take in

field or garden to learn that. This green stalk of groundsel, or of chickweed, or even the young shoot of rose, bramble, or honeysuckle, breaks off easily enough in your hand, and gives you a specimen of the herbaceous stem, but try some of the older second year's growths of the last-named plants, and you will find them tough enough, they are no longer herbaceous, but woody. You have here a practical example of the two kinds of stems and plants; the first herbaceous, green, succulent, and easily broken, such as are formed by one summer's growth; the second, brownish, tough, and woody, such as we find in shrubs and trees in or after their second year of existence. Between the well-marked herbaceous stem of the quick-growing weed, and the hardened heart-wood of the oak, we have, of course, every grade of distinction.

Compound or branched stems, and simple stems, give us another division. The first are so common, and comprise such a large proportion of our trees and shrubs, that to cite example would be superfluous; as to the latter, the grasses, such as wheat, rye-grass, the sedges, etc., give us good examples, and the common foxglove, amid others, an excellent one. The simple unbranched stem which supports the head of the dandelion, the umbel of the cowslip, or the spike of the plantain, and which is known as the scape, is more properly

a peduncle than a stem. In examining compound or branched stems, it will be as well to note that plants which have their leaves placed alternately, as a rule, give off alternate branches, and *vice versa* ;

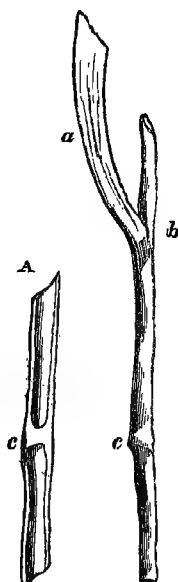


FIG. 87.—Portion of culm of a grass which is hollow or fistulous : *a*, leaf, which at *b* forms a sheath for the stem or culm ; *c*, knot, where the stem is divided by strengthening partitions. *A*, culm split, to show at *c* the knot or diaphragm.

and having already learned that branches take their first commencement from buds in the leaf axils, this is no more than we might expect. Having drawn your attention to the simple stem of the grasses, known as the culm, we must bid

you remember the division of vegetables to which the grasses belong—those with one-lobed seeds and straight-veined leaves, but which also bear the name of endogenous plants, from the peculiar mode of growth of the stems, which have their annual additions of new material made to the centre. This mode of growth we cannot see exemplified in the herbaceous grass, or indeed in any of our native endogens, but the giant palms of the tropics, could we get at them, would show not only this peculiar stem structure, but the noblest specimen of the simple, unbranched stem. Call to mind the pictures you have seen of some palm-clad island of the Southern Seas, and you will remember the simple stem of these beautiful and stately trees. To return to the grass stem (Fig. 87), examine it further. It is hollow, hence called fistulous; its hollow column, strong in itself, considering the amount of material, is further strengthened by knots or thickenings, at which a partition or diaphragm is thrown across the tube (Fig. 87, A). Moreover, the exterior of the green grass tube is smooth and shining from its coating of silex or flint substance. A wonderful combination of strength, lightness, and slender grace have we in the simple grass stems. The sedge of the water-side has also a simple stem and straight-veined leaf, but the stem is sharply triangular (Fig. 88, F), and has no knots. We go back to stems generally;

if we want an erect stem, this upright meadow ranunculus or buttercup gives us an excellent example, but for that matter we need be under no difficulty in finding many a wayside weed, which stands as erect as any volunteer rifleman. The reverse of upright we find in many another wee plant. The ground ivy, which shows its bright blue blossoms under every hedgerow in early spring, rests its procumbent or flat-lying stems on the ground; and almost similarly placed we find those of the ivy-

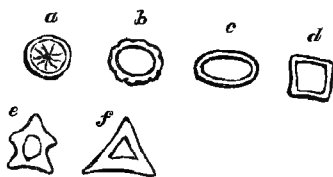


FIG. 88.—Section of Stems: *a*, round, as in the majority of plants; *b*, furrowed, as in many umbel-bearers; *c*, compressed, as in flat-stemmed meadow-grass; *d*, square, as in labiate plants; *e*, angular, as in common wallflower; *f*, triangled, as in sedges.

leaved speedwell, in which, however, the decumbent stems gradually merge into ascending ones. The decumbent stem does not rest so completely on the ground as the procumbent one. The prostrate, or trailing, or creeping stems, such as we find in the common yellow moneywort, root at various points as they go on, in a different way, however, from the long weak runners or branches of such plants as the strawberry, the common creeping buttercup, or the creeping cinquefoil,

These runners carry at their extremities buds or scions, which rooting, form new plants, and these, in time, become independent of the parent root by the withering of the connecting runner, a process which does not, as a rule, take place in the true creeping and rooting stem. Again, some stems tend upwards, but are so weak themselves that they must depend on their neighbours for support, such are the twining stems of the honeysuckle, the convolvulus, the bryony, or the bistort; others of these weak plants do not twine, but climb, as vines, peas, or vetches do by their tendrils; or as the now well-known canary-creeper and others, by hooking their stems and leaf petioles upon any supporting object. While looking at stem directions, do not, in your searchings, overlook stem forms; most, perhaps, are round, but not all (Fig. 88). Some, as in the hemlock-like umbellifers, are furrowed, others are flattened, as in the flat-stemmed meadow-grass (Fig. 88), many, as in our sweet-smelling friends the labiates, are square, the wallflower has its stem strongly angled, and the water sedges are many of them so sharply triangled that they will cut your fingers if you are not mindful. Winged stems occur, as in the thistles, where the leaves are decurrent or prolonged down the stems. The surface covering of stems is not less varied than their forms, the usual green has frequent spots and stainings. It carries hairs of all sorts and

degrees of stiffness, from the softest down to the stiff bristles of the viper's bugloss and its congeners, or the setæ or spines of rose or bramble; these, however, belong to the subject of plant-covering generally, of which hereafter. Our stems, hitherto, have been all honest aboveground stems, but we must notice some which, although claiming to be, and really being, true stems, yet hide them-

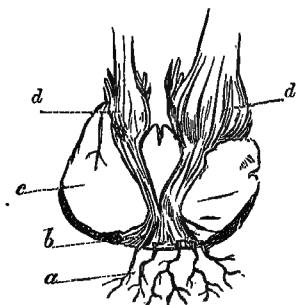


FIG. 89.—Root, etc., of common Crocus : *a*, rootlets; *b*, root-crown; *c*, solid underground stem, usually called the bulb; *d d*, leaf and flower-buds proceeding from underground stem.

selves under the surface of the soil. Such, most familiarly, are the corms, or underground stems, roots or bulbs they are often erroneously called, of the common crocus (Fig. 89). If you look at our illustration you will see that the rootlets are attached to the root-plate which underlies the mass that is generally called the bulb, and which is really rather an appendage to the stem than the stem itself. The scaly bulb of the white lily is a true

bulb, and is also classed as an underground stem. The common house-leek (Fig. 90), which delights to grow on old thatch, and delights the old lady of the thatched cottage by so doing, is essentially a bulb-stem with open scales, but it grows above-ground as an honest stem should do. The hyacinth, likewise a true bulb-stem, will grow either above or underground, it seems not to care which,

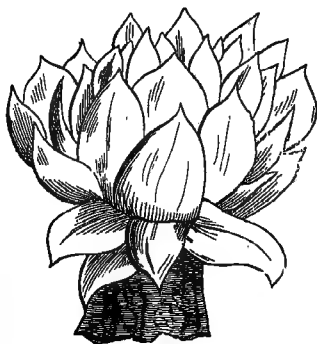


FIG. 90.—Fleshy-leaved aboveground bulb of common House Leek, corresponding to the bulbs of the common white lily or of the hyacinth, which are intended to grow underground, all being alike stems.

and the onion seems scarcely decided what to do, growing partly in and partly out of the soil; the latter another true bulb-stem, only with extended coats instead of scales. There is yet another form of underground stem, the rooting rhizome or root-stock, from which we have a succession of stems, as in the lily of the valley, the asparagus, some sedges and ferns, in the mints, and, to the farmer's

sorrow, in the twitch, or couch-grass. Lastly, we have plants like the primroses, the plantains, the dandelion, and many others, which offer us an apology for a stem, in a thickened neck, just above the root, from which is given off the crowd of leaves and flower scapes.

Now, with all these various forms of under-

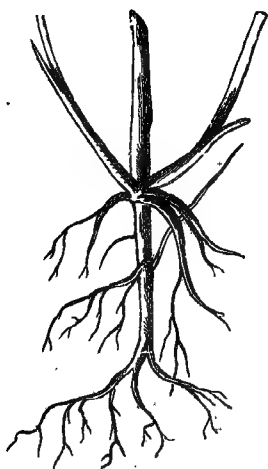


FIG. 91.—Root of White Sedge; mixed branched, and fibrous.

ground stems, we fear, our uninitiated readers will begin almost to think they will not know a root when they see one, and perhaps have doubts whether the familiar radish, whose very name means root, is really a root.

As we might expect, roots share many of the stem characters: they are annual, biennial, triennial, and

perennial ; they are simple and branched, and their structure is very similar to the stem. Many roots, as those of the grasses, composed solely of fibres, are fibrous roots. We will not give you an illustration, for you have only to pull up the first tuft of grass you see to get one. Other roots have, in addition to their fibres, their caudex, or root-stem, which

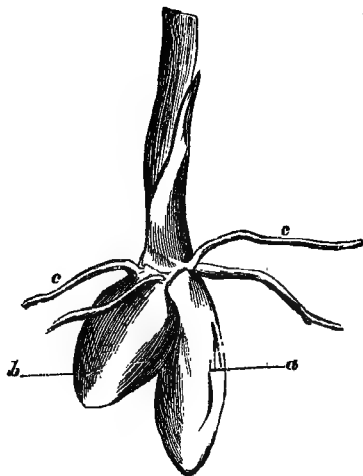


FIG. 92.—Root of Early Purple Orchis : *a*, exhausted tuber ; *b*, fresh tuber ; *c*, fibres of root.

may be simple, or branched, or fleshy. Fig. 91, which is the root of one of the sedges, shows a main root-stem, partly branched, from which the rootlets proceed. Fleshy roots, such as the carrót, parsnip, turnip, and radish, have their rootlets attached to the central fleshy caudex, chiefly at the

lower part; and according to the shape of this caudex they are classed as conical, spindle-shaped, globular, etc. In the last-mentioned cases, the fleshy portion of the root forms part of the central root-stem, or axis; but in tuberous-rooted or tuber-bearing plants, as the orchis (Fig. 92), the dahlia, some ranunculuses, etc., the fleshy portions are

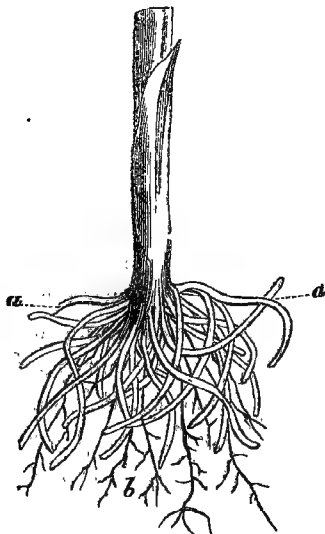


FIG. 93.—Root of Bird's-nest Orchis: *a*, fibre-like tubers;  
*b*, fibres or rootlets.

attached as appendages or tubers, and the rootlets enter the plant above them, and not at their lower end. The fascicled root, such as we find in the bird's-nest orchis (Fig. 93), is simply a tuberous root, only the tubers are long, thin, and numerous,

instead of thick and limited in number. The last roots we have to speak of are the aërial; we do not mean roots like those of the well-known banana, made still better known by Moore's lines, "They tell us of an Indian tree," or of the tropical orchids; but rootlets such as the ivy throws out to the wall against which it clings, using them as supports, but ready also to convert them into rootlets should occasion offer.

We need scarcely tell our readers that roots (except the aërials) serve first the purpose of fixing the plants to which they belong to the soil, and, secondly, that of absorbing moisture along with gases and salts for the nourishment of the plant. This absorption is effected not by the whole root surface, but by the extremities of the fibres or rootlets, these extremities forming what are called spongioles, being so constructed as to admit of more ready absorption of the nutritious fluids. Lastly, a few words are requisite respecting those fleshy masses which we have, for the first time, met with in the form of the turnip or the radish root, the tuber of the orchis, the corm of the crocus, etc. What is their intended use? They are simply stores of nutriment laid up for aiding the future growth of the plant itself, in its flowering and seeding, or for the nutriment of a new generation of younger plants. Throughout the vegetable kingdom we find this providential storing up for

future use often in the root, but sometimes in the stem, as in the crocus, in the fleshy scales of the lily bulb, or in the actual stem of the turnip-stemmed cabbage ; also, as in the well-hearted cabbage itself, in the leaves. Perhaps our readers have never reflected why a cabbage hearts, or a turnip forms its globe, or a carrot its long fleshy cone : they will not now forget that He who "opens his hand" and "fills" all "with good," thus doubly provides for the well-being and food of man, and for the due development of his "lower works."



## Handful VII.

*Composed of Plants with straight-veined Leaves—  
Snowdrop—Crocus—Tulip—Orchis—Wild Garlic  
and Black Bryony—The Perianth—Yellow Iris,  
or Water-flag—Petal-like Pistils—Herb Paris—  
Structure of Orchis blossom—Vegetable Structures  
—Cells and Vessels—Spiral Vessels—Vascular and  
Cellular Tissue of Leaf.*



## HANDFUL VI.

“ April smiles, and April tears,  
Welcome them together.”

WITH our Fifth Handful of “ Wayside Weeds,” and real veritable weeds most of them were, we also said adieu to the plants with netted veined leaves. As we have already remarked, in these our temperate zones, the netted leaf-veins characterize by far the largest proportion of our vegetable products, and, excluding the cereal and pasture grasses, by far the most important. They have accordingly engrossed the lion’s share of these light sketches of Flora’s kingdom ; that they do not, however, monopolize all the beauty, our next Handful of their straight-veined relatives fully testifies. Nay, so much beauty do we find in the collection, that we expect our readers will demur at the word weeds at all. Weeds or flowers, whichever they be, they are probably more familiar to the town dweller than many more common flowerets ; the most unmitigated townsman knows the snowdrop, the crocus, the hyacinth, the tulip, and the lily of the valley, those

bright and cheerful blossoms which meet us everywhere in early spring; in the woodlands, where the first of the company pushes up its pure white bells through the withered leaves of the gone-by year, or the snow of the present one, in the plot of the "town garden" or of the suburban dwelling; in drawing-rooms on stand or mantelpiece, or giving brightness to every shop or market where vegetable

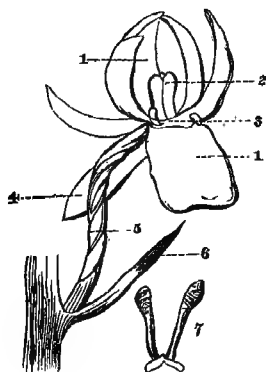


FIG. 94.—Blossom of common Purple or Meadow Orchis: 1 1, pieces of the perianth; 2, pollen pouches; 3, stigma; 4, spur; 5, twisted ovary supporting blossom; 6, bract. 7, Waxy pollen masses.

produce is sold, these bright-coloured blossoms proclaim that spring has come.

Take, as your first specimen of the second great division of flowering plants, those we have just named, only be careful that your tulips and hyacinths are single and not double blossoms,

observing the same rule if you add a narcissus or a jonquil to the bouquet. But, leaving the garden, let us seek in the meadows for the bright purple orchis blossoms (Fig. 94), which every child knows and gathers in early summer ; these are really wayside weeds, and waterside weeds are these bright yellow iris blossoms, which few can be so unobservant as to pass without remark. Possibly all may not know the wild garlics, but they are pretty flowers, especially the commonest of them, the white-flowered, broad-leaved species. Its smell certainly does not warrant its introduction into the company we have already given you, so take or leave it as you like. Other plants you may find with straight-veined leaves, and it is well to examine all ; and, last addition to the Handful, if you are gathering in midland or southern England, we give you the black bryony, which thrives so luxuriantly amidst the hedgerows, with its very bright, shining, and characteristic heart-shaped leaves, mentioned, you may remember, in one of our late lessons, as being exceptional in their veinings. It is the British representative of the yams of warmer climates.

Without again referring to the leaves of our collected plants, we pass to the blossoms, and you will at once observe the peculiarity which all possess of having their parts in threes or sixes. We must here premise that in the present division of plants,

the old familiar terms calyx and corolla give place to that of perianth, which is applied to the floral coverings, even although they appear external to, and distinct from one another, as in the snowdrop (Fig. 95). In the latter flower, observe, there are

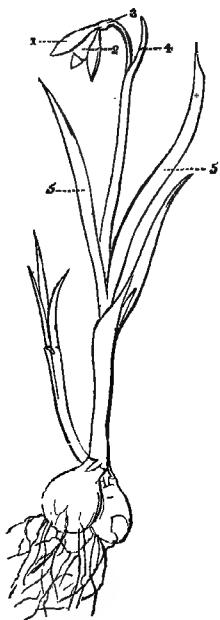


FIG. 95.—Common Snowdrop: 1, outer pieces of perianth; 2, inner pieces perianth; 3, ovary; 4, bract; 5, straight-veined leaves.

three external divisions of the perianth, and three within these; there are six stamens and three lobes to the stigma; lastly, the leaves are straight-veined, so that altogether the pretty little snowdrop is a

perfectly orthodox and representative member of the monocotyledons, or one-seed-lobed plants. Not less so the tulip (Fig. 96), with its six-pieced perianth, its six stamens (Fig. 97), and its three-lobed stigma (Fig. 98). Need we remind an unin-

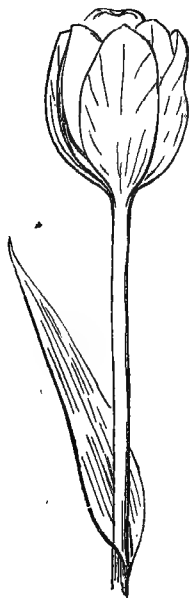


FIG. 96.—Blossom of common Tulip, with its six perianth pieces and straight-veined leaves.

tiated reader that if they look for wild tulips—they are rare to be met with, and only in a few special places—they must not expect to find the bright colours of the cultivated flower, but a plain yellow

blossom, which, however pretty in itself, has no claims to brilliant tinting. The lily of the valley—surely we need not try to describe the sweetest of woodland plants—has its six deep cuttings in its pure white bell blossoms, and the crocus, you will find, keeps up the family characters. Again, in the jonquil or narcissus we have the marked distinction between the internal and external perianth. The bright yellow, large, and handsome blossoms of the common iris or water-flag might well claim their place with any flowers, however gay, but they may also

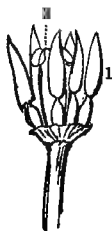


FIG. 97.—Essential reproductive organs of Tulip: 1, stamens; 2, pistil.



FIG. 98.—Pistil of Tulip with three-lobed stigma.

claim to be really wayside plants, so common are they by river and pond side in the bonny month of June; they well carry out the ternate characters of the petaloid division of the monocotyledons. But this we have had so well exemplified in the members of this class, in the snowdrop, tulip, crocus, etc., already adverted to, that we might have rested content with merely indicating the iris as a further example, had it not more to show us. You count the six divisions

of the perianth, thrée alternately being longer than the other three, but within these again there are three other flower-like parts, what are they ? Just raise one of them, for they are arched, and underneath you discover a stamen, and then it may probably occur to you, what really is the case, that

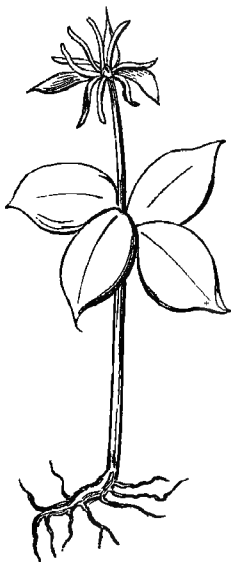


FIG. 99.—Herb Paris : with involucre of four whorled leaves or bracts.

these arched petal-like organs, being in the centre of the flower, must be the styles ; and truly they are petaloid or flower-like styles.

As a contrast and anomaly to the extreme regularity of the ternate blossoms and straight-

veined plants of the petaloid monocotyledons, we should mention that singular-looking plant the Herb Paris (Fig. 99), which those who have the chance of exploring damp moist woods may find in blossom in the month of May. The straight stem, the four, sometimes five ovate leaves arranged in a whorl or circle, from the centre of which springs the flower scape, and the flower not being composed of three or six pieces, are characters which combine to give us a very odd but interesting member of the present set of plants, and one which cannot be mistaken for any other member of the British Flora. Oddities, too, in their way, are the members of the next family, the bright and beautiful but very singular orchids. These plants have been so extensively and successfully cultivated of late years, that most of our readers must know some of the forms and appearances of foreign members of the tribe, even if they know not by sight the common "king-cups," or purple orchis of our meadows, the sweet-scented white butterfly orchis of our hill pastures, or some of the rarer and more singular forms, such as the bee and spider orchis, which abound in certain localities, more particularly in the south of England, and on chalky soils. Without digressing into many interesting particulars, we must confine ourselves to get the essential characteristics of the order, from the common early purple orchis, the *Orchis mascula*, which purples many of our meadows in the month



Pyramidal Orchis.



Spotted Palmate Orchis.



Bee Ophrys.



Monkey Orchis.



of May. We take one of its handsome spikes of flowers and pluck off a blossom (Fig. 94). You observe there is a bract at the base (Fig. 94, 6), and from the bract axil springs a twisted-looking stem or pedicel (Fig. 94, 5), this twisted support being the ovary or future seed-vessel of the plant, with its stigma spot (Fig. 94, 3) at its apex, surrounded by the six irregular pieces of the perianth. These also inclose two little pouches (Fig. 94, 2), which contain, not stamens, but little masses of waxy pollen (Fig. 94, 7). If you understand the above arrangement tolerably clearly, it will give you a clue to the construction of the beautiful and often grotesque blossoms of the orchis tribe.

All the plants which we have now placed in your hand belong to the petaloid division of the monocotyledons—a division which claims many of the brightest ornaments of our gardens; but yet all the petaloids, as we shall see in another Handful—we *must* make another—are not quite so bright in their clothing,

The flower and its parts, leaves, stems and roots, have each in succession claimed our brief notice and explanation; there but remains to be appended to our sixth and seventh Handfuls a few words upon the internal structures, as well as upon the outer covering or clothing of plants. As the point is one which you cannot very well verify for yourselves in this present early stage of your botanical learning,

you must take on trust the fact that vegetable structure generally is made up of cells and vessels ; or, if the latter be regarded merely as elongated cells, it may be said, even of the forest tree, that it is simply an aggregation of innumerable vegetable cells. However, the distinction into cell, and into fibre and vessel is more appropriate and convenient. The lowest tribes of plants, such as the seaweeds, the mosses, and the fungi or mushrooms, are really and truly made up of cells only. But we are talking of cells, when, perhaps, simple as the thing is in itself, few of our readers have formed any idea upon the subject. A cell is a very minute



FIG. 100.—Vegetable tissue magnified, showing cells and spiral vessels.

bag or vesicle, with very thin walls of vegetable tissue ; thin comparatively, but varying in the thickness of their walls considerably among themselves. These minute little cells differ much in shape, being round, oval, six sided, etc., and fitting closely to one another, or leaving interstices, or “intercellular spaces” between. Moreover, cells may be flattened, as we shall see in the cuticle or skin of the plant, or they may be elongated more or less, when they become vessels or fibres ; and as there are varieties

among the cells, so do they likewise exist amid the vessel or vascular tissue. There are vessels which are simply tubes, or it may be long cells with tapering ends; others are like series of shorter cells placed end to end, some are plain, others are dotted and marked. But the most remarkable and interesting to a beginner, as well as the most easily

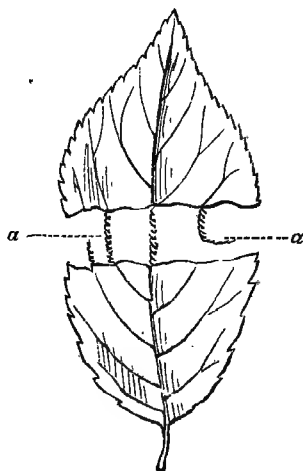


FIG. 101.—Rose leaf torn asunder to show *a, a*, spiral vessels.

observed, are the spiral vessels of plants. Take almost any leaf, a strawberry or rose leaf if you can, and tear it *very gently* across the leaf-veins. Observe as you do so, that you draw out some extremely fine, cobweb-like filaments, a few of which stretch entirely across the rent (Fig. 101); these are the

spiral vessels, which, although drawn out in this instance like an uncoiled spring, lie, in their ordinary condition, with their coils close together, mingled with the tube-like and other vessels, the cells being disposed amongst or around them in various ways. Fine as these vessels seem, yet are they sufficiently strong, if carefully drawn out, to support the one half of the severed leaf (Fig. 101), when retaining no connection with the other half beyond that afforded by the almost invisible spiral coil. In the leaf the distinction between the vessel-tissue and the cell-tissue is so strongly marked, that even the beginner cannot fail to note the former as making up the veins of the leaf, and the latter as filling up all the intermediate spaces. As you may suppose, the use of the cells and vessels of plants is chiefly to permit and promote the circulation of the sap, or of the fluids generally; but the former especially are also destined to serve as store-bags for the secretions peculiar to the tree or plant.

## Handful V. 33.

*Plants with Straight-veined Leaves and Petal-flowers*  
—*Plants with Straight-veined Leaves and Scale-flowers—The Scale-flowered or Glumaceous Plants—*  
*Common Rush—Wood Rush and Bog Asphodel—*  
*Their characters—Flowering Rush and Wake-robin*  
—*Duckweed—The Sedge Tribe—Grasses and Grass*  
*Blossoms—Plant Clothing—The Skin or Epider-*  
*mis—Hairs—Breathing Pores or Stomates.*



## HANDFUL VII.

“Then think I of deep shadows on the grass,—  
Of meadows where in the sun the cattle graze,  
Where as the breezes pass,  
The gleaming rushes lean a thousand ways.”

RUSSELL LOWELL.

Just let us remind our readers that we are among the straight-veined monocotyledons or one-seed lobed plants, and that this second great division of the vegetable kingdom is itself divided into two sections, the petaloid plants and the glumaceous plants, or those in which the floral envelopes are more or less corolla or flower-like, and those which have only chaffy scales to inclose and protect their essential organs of reproduction—the stamens and pistils.

With respect to the petaloids, we need scarcely say that the beautiful blossoms we reviewed in Handful VI. all belong to the section, but there are a good many other genera also claiming to be admitted within the petaloid boundary, which are by no means so flower-like. Indeed, some of them, because they cannot show a proper flower, seem as

if they would not show any, and have nearly naked blossoms. Nevertheless, we shall find some of the less conspicuous of the petaloids sufficiently interesting. The glumaceous or scale-flowered division of British plants is composed of two tribes only, the sedges or *Cyperaceæ*, and the grasses or *Gramineæ*. The former are comparatively unimportant; of the importance, or rather necessity of the latter, to man and animals, it is scarcely requisite to speak. We fear the glumaceous section of Flora's family is often shirked by the novitiate botanist; partly, at least, from an exaggerated idea of the difficulties which attend its study, and partly from the comparatively unattractive exterior of its members. Let us assure our readers that the difficulties are not so great, and that the interest well repays the trouble of surmounting them, such as they may be. But to these we shall return. Space compels us to bid you gather in one "handful" certain examples of the petaloids left unnoticed in our last Handful, and with them the glumaceous plants too. We shall find you plenty of both falling within the category of "Wayside Weeds," and none more so than, as the child's hymn speaks—

"The rushes by the water  
We gather every day."

What plant so familiar as that with which we began our first experiments in textile manufacture—who does



FIG. 102.—Plant of Hairy Wood-rush.



not remember it?—copying the nurse-maid or elder sister as she wove rush caps, baskets, and all the varieties of rush handicraft. Every one knows rushes, so get a few; but, remember, in blossom, that is, with the loose bunch of flowers protruding from the side of the straight round stem. There are many different species of the rush proper, but we fear to confuse by trying to distinguish between them, so simply gather the rush in flower. The wood-rush, especially the field species, is a Wayside Weed too, but it is a chance whether its reddish brown heads of blossoms, and bright yellow stamens, which show abundantly in spring, have attracted the attention of learners; nevertheless, look out for the plant, or for the greater hairy wood-rush (Fig. 102), which grows in woods. These wood-rushes, with their flat hairy leaves, are very different from the common rush, as you may see. If you are in a moor country you should put beside them the bog-asphodel, really a pretty flower, which from its abundance may well be called a weed. It, too, belongs to the rush tribe. The water plantain you must often have seen, its broad, long-stalked leaves, and diffuse panicles of small pale rose-coloured blossoms standing up from some pool in summer, or from ditches by the side of railway embankments, which are favourite sites for it. It, too, is a wayside petaloid, and so likewise, in some places, is the arrow-head, with its beautifully

shaped leaves. Then into the same section come crowding a large following of pond-weeds; you know these plants with dark olive-green leaves, floating on most pond surfaces, from which the little flower spikes shoot up in early summer; and lastly, there is the duckweed of our stagnant waters, which all summer long covers and protects them with its brilliant green fronds, till the ice covering surprises and supersedes it. If we have not already



FIG. 103.—Blossom of Wood-rush, showing perianth in six divisions, and style with three stigmas.

filled your hands too full, make way for a few glumaceæ. If you can recognize a sedge or two, get them, and any grass, from oats to meadow grass, which you can find in blossom, will do well to illustrate what we wish to say. You look distrustfully at your handful, the members of it seem so different from the plants you have been all along examining. Let us see? Do not forget the trine numbers of the straight-veined division, and go back to your rushes. Take a wood-rush blossom (Fig. 103), and

examine it through your lens. A three-stigma capped style in the centre is surrounded by six stamens, and these again by six segments of perianth or floral envelope, which are, as you will see, not petals exactly, but approaching thereto. The blossom of the rush proper you will find is not very different, but in some examples the stamens number three only.

The bog-asphodel, a first cousin of these rushes and wood-rushes, which has come out in bright yellow, and which holds itself half a foot high, or a little more, on the wet moorland on which it grows, has very much the same characters as its relatives; moreover, the capsules or seed-vessels of all are either quite three-celled, or imperfectly so, and three-valved; thus you see the ternate divisions of the monocotyledons are kept up.

A rush, and a flowering one, but not a true rush either, we omitted to bid you gather, but it is common enough in some places to make it at least a pondside weed. The handsome umbels of the tall "flowering rush" would indeed set off your handful, and well illustrate, in all its characters, our present divisions. Knowing these characters, it is sufficient to bid you compare the water plantain and the arrow-head—if you have got them—with the same standard. There is one plant, the arum or wake-robin (Fig. 104), common enough in England, and commonly known, which belongs to

this our petaloid section. We have already quoted it in Handful VI. for its singular and conspicuous bract or spathe, but it is so very diverse in appear-

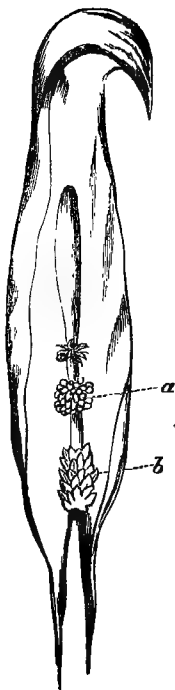


FIG. 104.—Arum Spathe, including essential organs of plant reproduction ;  
*a*, stamens ; *b*, pistils.

ance and structure from the usual types of the section, we have forbore to add it to your collection, fearing confusion. Remember, however, at some

future day that the wake-robin is a petaloid monocotyledon; but all ternate division of organs is lost, the stamens and pistils (Fig. 104) are indefinite in number, the perianth is wanting, and its place is supplied by the enveloping bract or spathe.

Quite as abnormal in its way, from our type, is this funny little duckweed which puzzles you altogether; you see a little leaf or a series of little leaflets—fronds they are often called—all conjoined, with a little water-root depending from each, but where the flower is, or even should be, is past your comprehension. The fact is, this little duckweed, so called because it affords frequent food to water-fowl, chooses rather to increase by means of little buds which take the place of the stamens and pistils, and so each little leaf throws out other little leaves on each side, but does not throw them off, for they remain attached to their parent, and these again, when they are old enough, send out their own little leaflets, and so on they go covering the surface of the pool from the fierce heat of summer, giving shelter and houseroom to myriads of water-bred little beings, and offering at the same time a wonderful example of a most attached family. Nevertheless, examine closely, and in some of the little fronds, or frondose leaves, you may find the two little stamens, and the wee little seed-vessel which is all this duckweed, or, as the botanist calls it, *Lemna*, has to offer. Do not confuse yourself by trying to connect

this curious and beautiful little plant with the other petaloids generally, but look at it simply as one of our wayside weeds, well-deserving in itself your attention. Moreover, do not omit to examine the delicate sheaths which tip the root fibre of each little leaflet.

Passing on to the glumaceous or second section of the British monocotyledons, we find it divided between the Cyperaceæ or sedge tribes, and the Gramineæ or grasses. As regards the former, we much fear that few of our uninstructed readers will recognize them as wayside weeds, common as they are. The cotton grass, it is true, attracts attention when its many heads of white, cottony, almost silky fibre, whiten the moorland in summer, but then all the flowering characters are gone. The bull-rushes or club-rushes may be known to some, but the sedge proper, or *Carex* family, is the most numerous in the division, numbering almost seventy British species. We must rest content with one illustration (Fig. 105), which may lead you to recognize the first sedge you meet with by land or water. The barren spike (Fig. 105, *a*) consists of stamens only, with a single scale (Fig. 105, *c*) at their base. These wither up after flowering. The fertile spikes (Fig. 105, *b*) consist of pistils only, each pistil likewise supported by its scale (Fig. 105, *d*), which finally protects the fruit (Fig. 105, *e*). The stems are of well-marked triangular form (Fig. 105, *f*).

With some little resemblance to the grasses, the sedges are yet very different, as the descriptions prove, and more diverse still in their useful import. Comparatively, the sedge has rarely any economical value: the grass tribes, directly or indirectly, are the staple of man's material life,



FIG. 105.—*Carex stricta*, or Tufted Bog-sedge: *a*, barren spike; *b b*, fertile spikes; *c*, *d*, scales of perianth; *e*, fruit, or seed; *f*, section of stem.

Important, however, as the second or gramineous division of the British *Glumaceæ* may be, we must dismiss it with but short notice. It would be quite useless to attempt to discriminate for a beginner the

differences between the tribes or genera of grasses ; it must suffice to point out the parts of the grass blossom, or the peculiarities of the grass plant, and leave those who wish, to confirm them for themselves. Take any grass you chance to meet with, but a large species, with what you probably call the seeds large too, will be best. Observe, first, the narrow straight-veined leaves, and next, the cylindrical hollow stem with joints and knots at intervals, the

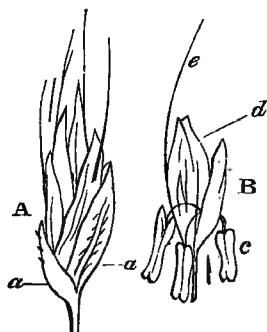


FIG. 106.—A, Spikelet of Brome Grass ; *a a*, glumes, or involucre, inclosing grass florets. B, Single floret of Brome Grass ; *d*, glumellæ, or perianth ; *c*, stamens ; *e*, awn.

leaves sheathing the stem. The seeds or blossoms are disposed in spikes, as in the case of wheat or barley, which, perhaps, it is unnecessary to say are real, true grasses, or more loosely in panicles, as in oats. Now take one of these grass blossoms (Fig. 106), and if the plant really be in blossom, you will observe, hanging out, the loosely-attached stamens

—"versatile" is the proper botanical term—three in every distinct species of British grass, but one, the sweet-scented meadow grass, which has only two of these organs ; you will, probably, also observe the little feathery stigmas protruding beside them. The scales, or paleæ, or valves, for they have all these



FIG. 107.—Floret of Melis Grass, showing feathery stigmas.

names, which include the stamens and styles, are, as you will observe, generally in pairs (Figs. 107 and

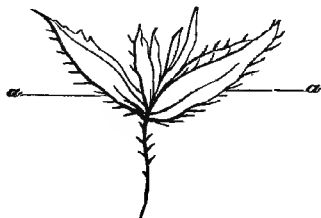


FIG. 108.—Spikelet or Locusta of Meadow Soft Grass ; a a, glumes or involucres, inclosing florets.

108) ; a number of pairs making up a little spikelet (Fig. 108). From the extremities of the scales, generally from the outer one, and often from its back, arise long, thread-like projections, which have the name of awns. Barley, rye, and the beautiful feather-grass afford us some of the best

examples of the awn in full development. Of course these awns give valuable characters in distinguishing the various species of grass from each other, but if you will examine the diverse scales which compose the spikelet, or locusta, as it is called, you will find they have many distinctive marks besides ; some are more or less covered with hairs ; some have many or few veins or nerves ; and whilst some are pointed at the apex, others are blunted, and others "bifid," or forked."

We have yet, however, to speak to you of the structure of this flower spikelet as a whole. The outer and lower pair of scales or glumes (Figs. 106 and 108) were at one time regarded as equivalent to a calyx, but as in many grasses they inclose a considerable number of florets, they are now more properly regarded as bracts, constituting an involucre, such as we remember in our old friends the composites, consequently the pairs of scales inclosed by the glumes, instead of being equivalent to a corolla, must be looked on as the perianth of the blossom. These inclosed scales are often called *paleæ*. The grass stem gets the distinctive name of *culm*.

#### PLANT CLOTHING.

"If God so clothe the grass of the field."

A very varied wardrobe have these "lilies of the field." The richly coloured petals, sometimes brightly coloured calyx or bract, the

leaves of every surface variety, the bright shining stems of the grasses, or of the smooth, richly-spotted hemlock, the bark of birch, beech, oak, or pine, are all portions of our plant clothing. True it is that much of the colour which varies the plant exterior belongs rather to the colour cells just below the plant covering or cuticle, than to the cuticle itself, but still we may legitimately regard all as part of the array which God has given. A covering which permits the free transmission of colour must, necessarily, be extremely thin and transparent,

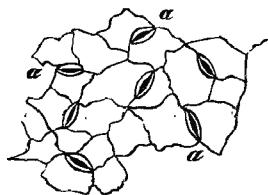


FIG. 109.—Plant Cuticle magnified, showing outlines of cells.  
a, a, a, Stomates or breathing pores.

and this any one may see who will take the trouble to carefully strip the cuticle from a leaf; put under a tolerably good microscope, it will exhibit that appearance shown in Fig. 109, the irregular lines marking the boundaries of the flattened cells which form the cuticle. These cells, which are in one or more layers, although generally transparent, are occasionally coloured, and in many instances contain waxy or siliceous (flint substance) deposits, the latter substance is found particularly in the stems of the

grass tribes, and more especially in those of the horse-tails, or "jointed ferns," we do not, however, yet number the latter among our acquaintance.

In these plants the cells of the cuticle contain the siliceous grains so abundantly, and withal so symmetrically arranged, that it is possible for all the real vegetable substances to be removed, and still the stem will retain its form. Moreover, the presence of this crystalline sand, for it is nothing else, fine and minute as it must necessarily be, renders these comparatively unvalued plants of some commercial importance as polishing agents to the cabinet-maker, the whitesmith, and others.

It is not, however, colour only which the plant cuticle allows to pass, but, what is much more important to the vegetable economy, it permits the free ingress and egress of moisture, and of air or gases, not indeed through its entire surface, but by means of the little breathing pores or stomates (Fig. 109 A), which are so thickly scattered over the plant exterior; in most, on the under surfaces of the leaves chiefly, the principal exception to this being in the case of floating leaves of aquatic plants, where, obviously, the stomates would be useless on the under surface, and, consequently, we find them on the upper. Each little stomate, as represented, is composed of a couple of oblong cells, with an opening between them communicating with the cell tissues which compose the sub-

stance of the leaf. These little cells are the door-keepers, for, being hygrometric, that is, affected by the presence or absence of moisture, in dry weather they contract, and by shutting up the little opening between them prevent the plant losing more moisture by evaporation than it can afford; in moist weather the reverse takes place. It would be out of place here to enter into a consideration of plant respiration and digestion, which go on in the leaves mainly by the communication effected between the plant tissues and the atmosphere through these sensitive little pores; suffice it for us that we see how this cuticle of the plant, the epidermis it is called by some, contributes essentially to a function on which not only the health and growth of the vegetable world depend, but also, by the purification of the air, effected by vegetable respiration, the health of the animal creation likewise. The stomates have been alluded to with reference only to the leaves; they occur, however, but not so abundantly, on most other parts of vegetables, varying greatly in number upon different plants. On the roots underground, where manifestly they would be of little or no use, the stomates do not occur.

Beautiful, however, as may be the plant covering, whether in its own bright polished surfaces, or in the transparency which permits the passage of the brilliant colours which tinge the cells beneath

it, we find its beauty and variety wonderfully augmented by the manifold differences of its hair appendages. Hairs have we of every form, simple as in most plants, stellate or star-shaped (Fig. 110 B), beaded, forked (Fig. 110 A), gland-bearing (Fig. 110 C), and soft as down, satiny, as in the mountain lady's-mantle, or stiff and rough, until they go a step farther and become hardened into the prickles of our roses and brambles ; venemous,

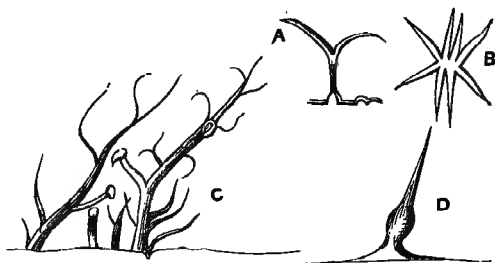


FIG. 110.—Hairs from plant surfaces magnified. A, Forked hair; B, Stellate or star-shaped; C, Branched and gland-bearing hair; D, Tubular hair of nettle with poison-gland at its base.

too, are some hairs, as the nettle frequently reminds us, whilst some of the glandular kind secrete an oily, sticky fluid ; lastly, we have the chaffy scale clothing of the young ferns, another cuticular appendage. It would be superfluous to offer our readers many examples of a plant character so easily accessible as the hair appendages of the cuticle, and we would not deprive them of the

pleasure of examining, as they can so easily do, for themselves, by merely plucking not only leaf after leaf, but plant after plant, in their walks, and using their lens. We mention plant as well as leaf, because the arrangement of the hairs on plant stems is often interesting and characteristic, as in the common speedwell, common chickweed, etc. We must not forget to mention that one little spot, and one only of the entire plant, the stigma of the blossom, is left uncovered by the cuticle.



## A Bunch of Ferns.

*Ferns well known—Their elegance—Characterized by the absence of floral development—Spores, and Spore or Seed cases—The varying form of Ferns—Peculiar mode of Early Growth—Fern gathering—The Male-fern—Lady-fern—Hart's-tongue—Brake, or Bracken—Polypody and its spores—Spleenwort—Moonwort—Horse-tail and Adder's-tongue—Characters common to Ferns—Caudex, or Root-stalk—Stipe—Rachis and Pinnæ—Sori—Spores and Spore cases—Exceptions to position of Spores on back of Frond, etc.*



## A BUNCH OF FERNS.

"Barren tracts are colonized by ferns long before many other tribes could vegetate thereon, and on sterile soils where other plants would perish for want of food the hardy ferns find sustenance enough."—BURNETT'S "BOTANY."

THERE are few, perhaps, in the present day, who do not know what is meant by a fern, or who do not know an ordinary fern by sight, and, possibly, the town resident is even more familiar with these elegant but withal flowerless members of the floral world, than he is with many more common wayside weeds. Ferns and fern-cases in houses, fern-covered rock, and ferns in Crystal Palace and winter gardens, have become fashionable and favourite objects of interest; and well they may, for there are few more elegant forms in nature than those presented to us by "fern fronds" as the leaves are called. True, many of the most elegant—no other adjective so well expresses fern beauty—are not of the number of our British Wayside Weeds, but still we have many a fern which may rank as such among forty or fifty British species, and some of the commonest, such as the male and the lady-fern, and even common brake,

boast of much beauty. We cannot pretend to make our bundle a large one, and before we attempt to form it at all, we must make sure you know a fern when you see it. The first characteristic, moreover, is a negative one—the entire absence of those floral organs which have engaged so much of our attention hitherto. The second character is the presence, on the back of the fronds, of those collections of seed-cases and spores that represent the “fern seed,” so famed in olden time (Figs. 112, 113, 114), which stand in the place of flowers and their essential organs of reproduction. This character you will of course find only when the plants are somewhat advanced in age, and even not then upon all the fronds, varying too in appearance (Figs. 112, 113, 114) from the round “sori” covered by their kidney-shaped involucre, as in the male-fern, to the naked sori of the common polypody (Fig. 112), the prolonged sori of the hart’s-tongue (Fig. 113), or the marginal covered spore collections of the common brake, or elegant maiden’s-hair of the fern-case. For another character we must look to the very earliest stage of fern growth, and it is so peculiar, that having once recognized it you cannot be deceived as to the nature of the plant which is springing into its vegetable existence. Ferns for the most part come up in what botanists call a “circinnate,” or “gyrate” form, the future frond being curled up in the most curious and wonderful



**FIG. 111.**—Frond of common Polypody : *a*, frond ; *b*, rachis ;  
*c*, stipe ; *d*, caudex, or root-stalk.

**FIG. 112.**—Portion of Frond of Polypody, showing naked Sori.



manner, in some cases, as in the common bracken, looking more like a brown caterpillar than an embryo plant; and not only is it the mass of the frond which is thus curled upon itself, but every minute division of the many-cut leaf is likewise curled, so that there is curl within curl, and, if you will look for them in the month of May, you will find the fern fronds in every stage of uncurling,

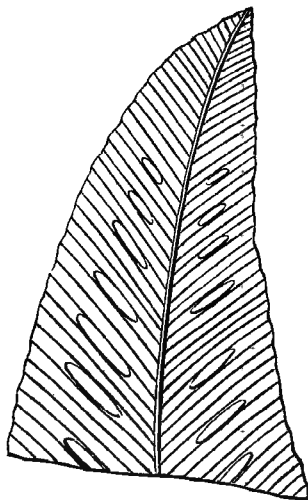


FIG. 113.—Portion of frond of Hart's-tongue Fern, showing oblong sori, or spore collections.

commencing like a caterpillar, shooting up into the likeness of a pastoral staff, and finally imparting the full form of its leaf-beauty. And how full and beautiful are the coronas of the male fern, which almost seem to attempt the tree forms of more

southern climes, the elegant drooping clumps of bright green lady-fern, and the miniature forests of the bracken, that offer a leafy curtain and good concealment to the crouching deer.

With the characteristics pointed out, and with the idea that you either have some notion of a fern, or can get some one to show you, we start you in search of your bundle, and bid you gather everything you meet with, by hedgeside, rock crevice, or wall, which you think resembles what you are seeking for. Probably you will get the very common male fern, *Lastrea filix mas*, its handsome fronds often exceeding three feet in length, and, as already observed, when growing undisturbed, taking the form of a circle or corona springing from the common root-stock. You may get the lady-fern, *Athyrium filix foemina*, for, loving shade and moisture, in some localities it is very abundant, growing along with the male fern, but distinguishable from it, with a very little attention, by its much more delicate and elegant, almost feathery, formation, with tendency to droop, and by the sori being of a more elongated kidney-shape. There are other minute differences, but of these it would be useless to speak here. In the same shade and clump as the lady-fern loves, if there is rock or stone wall, there will probably be for you a specimen of the hart's-tongue (Fig. 113), only here there is no finely-cut leaf, but a long, plain, and yet elegant withal,

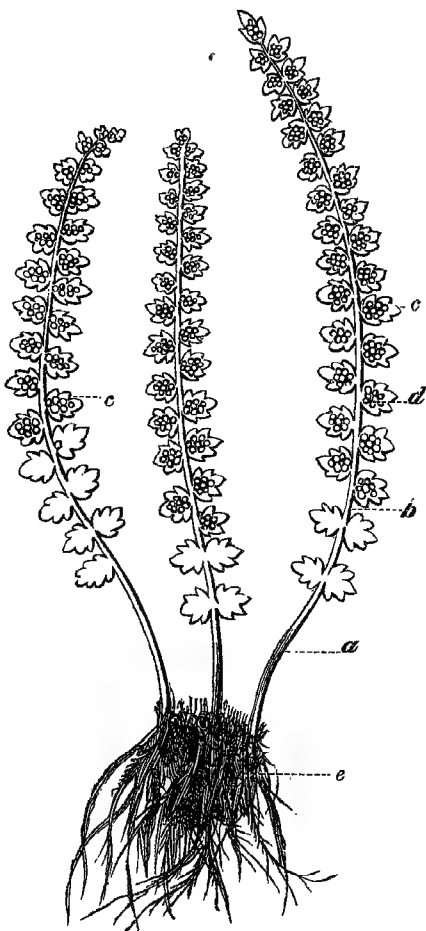


FIG. 114.—Fronds of *Asplenium viride*, or Green Spleenwort: *a*, stipe; *b*, rachis; *c*, pinnæ of frond; *d*, sori; *e*, caudex.



riband-like frond, with the true fern curl in its young state, and with very long sori (Fig. 113) on the back. Occasionally you will find the hart's-

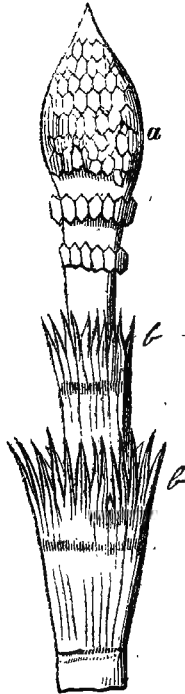


FIG. 115.—Horse-tail, fertile spike. *a*, fructification.

tongue fronds forked at the extremity, and very variable in length, from one foot to three. The bracken or brake cannot escape you, as it is perhaps

the commonest of all, fringing the hill-sides and wood-sides, and wide-margined country lanes, with its tall growth, the stipe or stem supporting the three-divisioned and much-cut fronds well above the earth, and the entire plant reaching a height of three, four, or more feet. The sori are what are called "marginal," and are as it were covered by the edges of the frond turned over them. Lastly, on some bank you will come upon the common polypody (Fig. 111), certainly one of the plainest of its family, but a very characteristic fern, with its boldly marked and bright yellow sori (Fig. 112), presenting their spore cases without either the involucre of the male fern or the marginal foldings of the bracken.

Of course, according to situation, you will get other ferns besides these—it may be some one of the aspleniums or spleenworts (Fig. 114); but those already mentioned will suffice for our purpose, more especially as we would have you add a moonwort (Fig. 116), a horse-tail or two (Fig. 115), and an adder's-tongue if you can, from the damp meadow. Queer names these two last, but they are all of them near relatives of our fern friends, and our bundle would be incomplete without them, and indeed is scarcely complete now without a club moss or two; but as these do not quite come under the category of "Wayside Weeds," we may venture to omit them.

And now let us survey our collection, and gather-

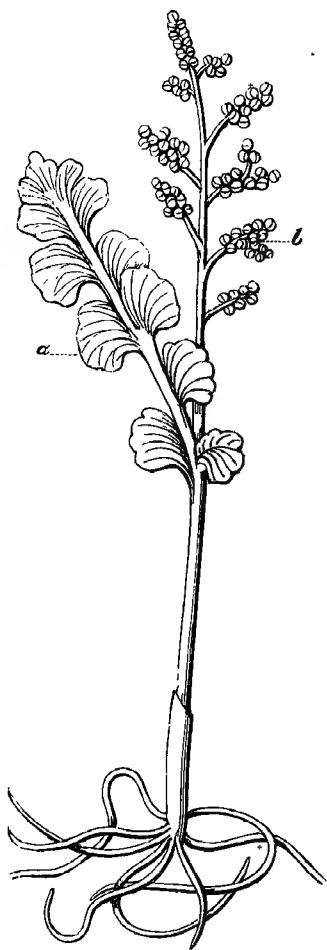


FIG. 118.—Moonwort. *a*, frond; *b*, fructification.



if we can, their common characters. In the first place, we have the fern itself constituted by the frond (Figs. 111, 114), this frond being supported by a central stem, or, as it is called, the "stipe," and this again springing from a root stock, "caudex," or rhizome (Fig. 111), from which the true root fibres are developed. When the stem or stipe of the fern frond passes into the frond itself it takes the name of "rachis;" and passing through the centre of the frond, becomes, as in the hart's-tongue fern, as it were, a central midrib; in others, as the polypody (Fig. 111), the spleenwort (Fig. 114), etc., it forms the central support from which the lateral divisions, or, as they are called, "pinnæ," are given off. The frequent presence, especially in young fronds, of "chaffy" scales upon both stipe and rachis will scarcely escape the observation even of a beginner, and we need only again refer to the peculiar mode of the springing of the young fronds to secure attention.

Lastly, we come to the most peculiar characteristic of the fern tribe, the means of propagation, or what people generally would call seeds, but which for special reasons botanists term spores (Figs. 112, 113, 114, 117). These it is almost superfluous again to remark are produced without anything resembling the flower of the vegetable kingdom generally, and are for the most part collected upon the back of the fronds, the collections

getting the name of "sori," and varying greatly in shape, as already mentioned. And now, to go further, you will need a good magnifying-glass or small microscope to enable you to see that each sorus, whether round, or naked as in the polypody (Fig. 112), or covered with an indusium or involucre, as in the male or lady ferns, hart's-tongue (Fig. 113), and spleenwort (Fig. 114), or with the frond margin as in the brake, is made up of a number of minute membranous cases (Fig. 117), each sup-



FIG. 117.—Spore Case, or Capsule, magnified.

ported on its tiny stem, and surrounded by an elastic-jointed ring. In each spore case are contained, fine as dust, the true fern spores—"fern seed," if you like it better—and when fully ripe the elastic surrounding ring (Fig. 117) tears open the little treasury. It is difficult to imagine a more beautiful little arrangement, and marvellous indeed would it seem to us, were it not that the continued never-ceasing marvels, the continued never-ceasing creations of His hand, who made both heaven and

earth, are so constantly before us that we almost forget that each and all are miracles. We can scarcely realize that every unfolding of a blossom, every springing into growth and beauty of the tiny seed, and microscopic spore, is as much an act of creation as that which took place when

“The morning stars sang together.”

Although, for the most part, the fern fructification or spore development is upon the back or margins of the frond, it is not invariably so; in one or two instances, even in Britain, the spore collections are concentrated, as in the *Osmunda*; or Royal Fern, or, as it is often and erroneously called, Flowering Fern. In the case of this truly splendid fern, the tallest of our British natives of the tribe, the sori capsules are so thickly clustered at the extremity of the frond, as quite to obliterate its leafy character, forming to it a brown branched apex, which some stretch of imagination might convert into masses of unopened flower buds. Another, rather a relative of the ferns than a fern itself, the curious-looking moonwort (Fig. 116), has a barren frond, that is, one free from fructification, and, springing as it were from it (Fig. 116), a branched fertile panicle of spore capsules. These capsules are without elastic ring. If you chance to know or to find the adder's-tongue in your bundle, you will have a plant closely related to the moonwort,

but with its fertile spike unbranched, and its plain barren frond still less fern-like than that of its near relative just mentioned.

In the same category of flowerless plants, but still further diverging from the ferns, both in appearance and habit, and yet so common in some of its species that it is truly a "Wayside Weed," we have the horse-tail tribe (Fig. 115). The hollow, black jointed, creamy-coloured, fertile stems, crowned with their black masses of spores, can hardly escape observation in spring, although an inexperienced observer would scarcely associate these with the later showing barren spikes, rough and wiry, and many jointed, and many branched.

# A Chapter on Classification.

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## CLASSIFICATION AND ARRANGEMENT OF PLANTS TO BE LEARNED FROM COMMONEST WEEDS,

*The Natural Classification—Plants evidently in groups—Retrospect—Division into Flowering and Flowerless Plants—Flowerless Plants—General Characteristics—Flowering Plants—Division into Plants with Straight-veined Leaves and with Netted-veined Leaves—Importance of Distinction—Plants with Netted-veined Leaves—Divided into three principal Sections—Subdivision of Sections into Natural Families—Subdivision of Families into Genera—Genera composed of Species or of Individual Plants—Advantages of a Natural Classification—Artificial Classification—Concluding Remarks.*



## A CHAPTER ON CLASSIFICATION.

STEP by step have we traversed the highways and byways of Flora's kingdom, and as we have kept tolerably close to the beaten track, we have encountered for the most part that which we came to look for, the "Wayside Weeds" in all their common and most familiar aspects, and yet these have served, in accordance with our plan laid down at the outset, to teach us a few, at least, of the principles according to which the floral realms are regulated. We have learned why certain forms of plants are grouped together, and why they are separated, by lines of natural demarcation, from others, and thus we have, it is hoped, got some idea of

### CLASSIFICATION.

Moreover, the classification we have learned is "natural," it associates for us groups of plants which, even to an unpractised eye, have points of "natural affinity." The most superficial examination cannot fail to shew that the leguminous or pea tribes, the umbellifers or hemlock-like plants, the rosaceous families, the composite or daisy and

dandelion connections, are each made up of certain numbers of individual members or "species," which are intimately related to each other. Bearing these facts, and others of the same kind, in remembrance, we look back over the ground we have traversed, and first we see the two great divisions into

Plants with Flowers,\* and  
Plants without Flowers.

The latter of these divisions it is true has received but scant share of our attention, but it must not on that account be deemed unimportant: from the magnificently elegant tree ferns of southern climes, to the mould which covers the damp surfaces of decay, or the crimson vesicles which stain the snows of the arctic regions, the flowerless tribes include a vast collection of vegetable entities each and all fulfilling their purposes in God's creation, and not one of them devoid of interest, or unendowed with its own peculiar beauty; but yet, with exception of the ferns and a few of their nearest connections, the study of the flowerless tribes is neither very attractive, nor perhaps likely to be well understood by a novitiate learner in botanical science.

In accordance with our simple plan, the flowerless plants we have noticed, the ferns, the horse

\* Our readers it is hoped have not forgotten the definition of what a true flower is essentially.

tails, the club mosses, have been known to us only as "flowerless plants;" but it is right we should know them also under their more scientific name of "Cryptogamia" of the artificial classification of Linnæus, or of "Acotyledons" of the natural classification, which has been followed in the foregoing sketches. The name Cryptogamia, literally, "hidden marriage," was given by Linnæus in accordance with his ingenious; and, we might say, beautiful theory respecting plant-nature; the term Acotyledon is applicable because of the absence of the cotyledonary bodies, which, either singly, or in pairs, characterize the flowering plants. Either name indicates a marked distinction between the reproductive organs, and apparent mode of propagation of the flowerless, and the flowering plants. There is, however, yet another distinction, not so apparent to the eye, but yet well marked, in the inner structure of these plants, and this too gives to the flowerless plants generally the name of Cellulares, and to the flowering plants that of Vasculares; for, although the higher ranges in the flowerless division, such as the ferns, etc., contain their own peculiar and characteristic vessels, the lower ranges, from the mosses and fungi downwards, are little more than masses of cells. To enter further into these divisions would be beyond the scope and design of our work.

We retrace our steps still further along the paths of flower-land, and again we come to two

great divisions, into which plants possessing essential flower organs are divided :—

Plants with one seed-lobe, or cotyledon, MONOCOTYLEDONS ; plants with two seed-lobes, DICOTYLEDONS.

Also, from the mode of growth peculiar to each, called endogens and exogens : that is, plants the yearly growth of which takes place by additions to the centre of the stem, the endogen ; or, by additions between the bark and the stem, the exogen. The latter represents the great mass of plants which make up the larger vegetation of our temperate zones, including our forest trees ; the former the tropical vegetation, the palms, the bananas, the bamboos ; but also the grasses and grains, the lilies, snowdrops, and crocuses of northern regions. Our readers may remember that these endogenous or mono-cotyledonous plants are those characterized by straight-veined leaves, and for the most part by a ternary division of the parts of the flower ; the exogens, or di-cotyledons, by leaves with interlacing veins, and no fixed division of the flower organs.

Leaving behind us the great section of straight-veined, one-seed-lobed, central growing flowering plants, we find the netted-veined, two-seed-lobed exogens, once more divided naturally into three groups :—

Plants which have the corolla in many pieces, represented by our old friends the ranunculuses, poppies, etc.

Plants which have the corolla in one piece, represented by the primroses, dead nettles, etc.

Plants in which both corolla and calyx are resolved into one floral covering, represented by the buckwheats, docks, etc.

Again these groups have, as already pointed out, their own subdivisions, dependent chiefly upon the attachment of the stamens and pistil, till at length, by tracing other differences, we reach the natural families of plants so frequently alluded to, as the Ranunculaceæ, Rosaceæ, Umbelliferæ, etc.

But a "natural family" is itself only a group of other smaller groups, the number of the latter varying greatly. Each of the smaller groups is known as a "genus,"\* and, lastly, each genus is but an aggregation of individual plants, each of which is called a species. For example, it may be remembered that in our opening chapter, where the ranunculus or buttercup genus is cited, mention is also made of various kinds of buttercup, which, although bearing an unmistakeable family likeness, were yet found to offer minor differences, such as a turned back calyx, a bulbous root, a furrowed peduncle, which marked them as essentially different from each other. These, therefore, are different kinds or "species" of the *Ranunculus* genus; but the *Ranunculus* genus, though representative of the "natural family" of the Ranunculaceæ, also associates with itself in that family a number of other genera,

\* Plural, "Genera."

such as the anemones, columbines, etc.—associates them by reason of certain family relations, but distinguishes them from each other by well-marked generic distinctions. A little observation, and the use of a “Flora”\* will soon familiarize any one with the nature of these specific, generic, and family differences, although it may be long before the actual distinctions are fixed in the mind. Neither must a learner expect to find all plant families as strongly marked out and as easily recognizable as those which we have chosen as illustrations, because of their distinctness; but the interest will not be less, or ought not be less, because of a little difficulty. It may be the artificial classification offers an easier path at first, and in some respects presents undoubted advantages, but the knowledge it gives is often more apparent than real. On the other hand, the natural groupings cannot be studied without acquiring much real information illustrative of those natural bonds of connection, which, extending throughout the whole vegetable world, combine it into a perfect whole, all the more perfect because of the wonderful number and variety of the tribes and families, the genera and species of which it is composed.

\* A Flora is a work devoted to the description, in a classified form, of the plants peculiar to any district or country.

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